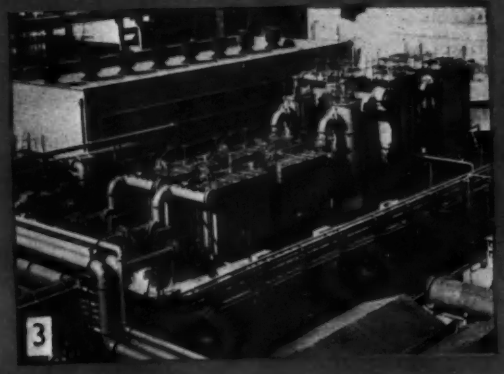
Gas Journal

VOL. 290. 109th YEAR. LONDON, JUNE 12, 1957. No 4900. PRICE 1/6

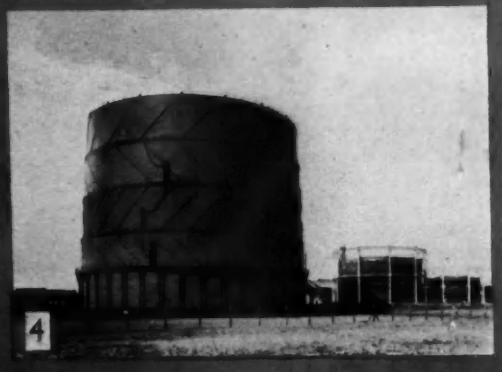
DETROIT

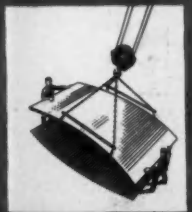
WHESSOE

some recent



installations





1: Benzole scrubbers built for Woodall-Duckham Construction Co. Ltd. for The National Coal Board at Chesterfield.

2: Gas Drying Plant built at Bromley for North Thames Gas Board.

3: Two complete purification streams supplied to Woodall-Duckham Construction Co. Ltd. for East Midlands Gas Board at Rotherham.

4: 3 million cubic feet capacity welded gasholder at Bishop Auckland for Northern Gas Board.

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IN GASEOUS ATMOSPHERES, in Chemical, Gas and Refrigerating Plant, Siebe, Gorman equipment safeguards life and health. It covers all routine and emergency requirements, involving repairs, inspection and rescue.
Here are some typical applications:
SELF-CONTAINED BREATHING APPARATUS. Compressed air and oxygen types with durations from ¼ hour to 2 hours.
RESPIRATORS of the filter type. "Puretha" Mark IV and "Gaspro" Gas Respirators. Also dust and fume masks.
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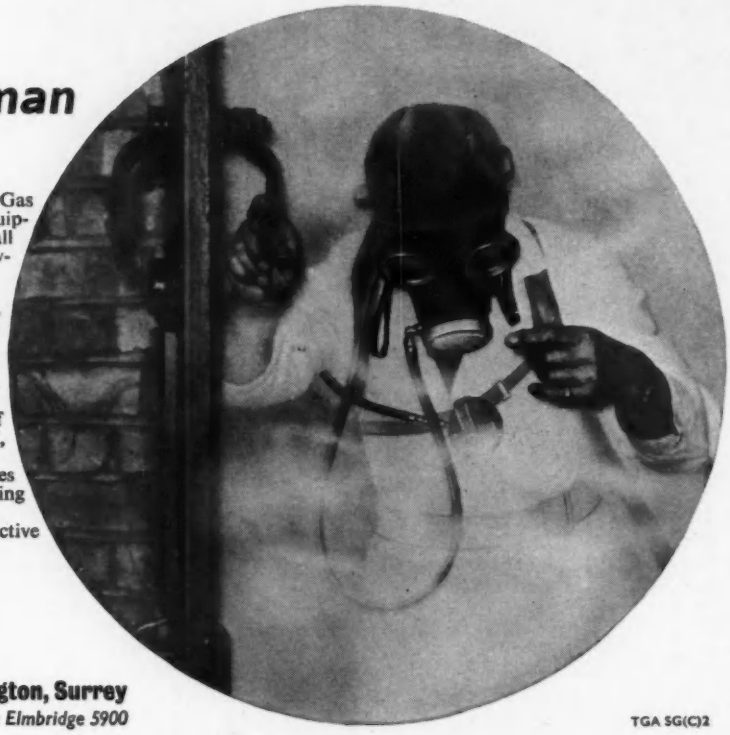
GAS DETECTION APPARATUS and Protective Clothing of all types.



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HIGH SPEED VERTICAL RECIPROCATING TYPE. FOR PRESSURES UP TO 100 lbs. PER SQ. IN.

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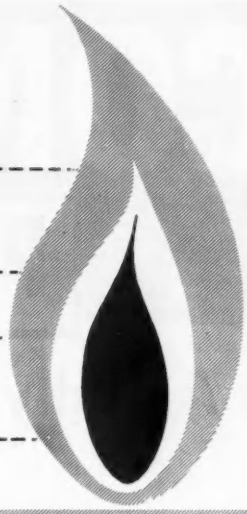

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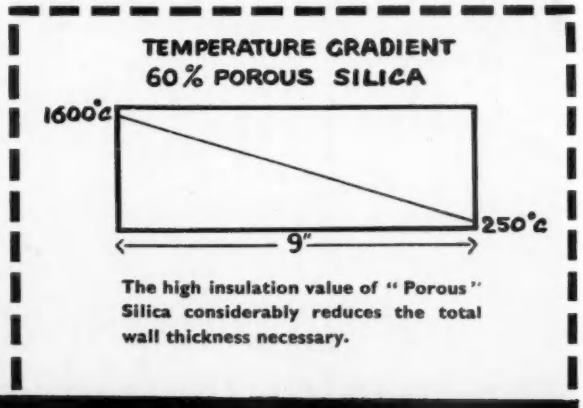
A really high-temperature INSULATION...

- Developed and manufactured by the Consett Iron Company Limited, "Porous" Silica Insulating Bricks have become established as an important addition to the existing range of refractories.
- Possessing the advantages of a normal silica brick combined with high thermal efficiency, "Porous" Silica offers to the furnace builder a spalling resistant silica refractory suitable for hot-face insulation at high temperatures.
- Already in wide use in the glass industry for roof insulation "Porous" Silica Brick is also suitable for the construction of kiln roofs and side walls where its light weight and insulating properties are important factors in design and service.
- "Porous" Silica Bricks are made in two grades, 60% and 50% porosity, the latter possessing a higher mechanical strength, rendering it the most suitable for constructional work.

Further information will be gladly supplied on request.



The high insulation value of "Porous" Silica considerably reduces the total wall thickness necessary.

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LIMITED
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Telephone: Consett 341 (12 lines) **Telegrams: STEEL PHONE, Consett.**

Electrolux is built for non-stop service . . .

Like a watch, Electrolux Gas Refrigerators are never idle. They give a non-stop 24 hour service, day and night, month after month, year after year. No easy task. But then, Electrolux Gas Refrigerators are built to last. Every time you sell an Electrolux, you can be sure that your customer will get many years of trouble-free service. There's no short-cut to experience — and there are over 30 years of manufacturing experience behind Electrolux Gas Refrigerators.

ELECTROLUX — THE FLAME THAT FREEZES

ELECTROLUX LIMITED, 153/5 REGENT STREET, LONDON, W.1.

WITH BEARINGS IN MIND...

...consider these points when you buy conveyor idlers

2-not 6 bearings on Joy Limberoller idler

Among the outstanding features of the Joy Limberoller idler is the reduction — by 20% — of friction drag as compared with the conventional 3-roll steel idler.

The six bearings on a 3-roll idler often present difficult lubrication problems and four of the bearings are in hard-to-reach spots under the belt where dust and dirt can find an easy entry. Clog one of these bearings; slow or stop the roll...and replacement costs for belt and idlers start to soar.

The Joy Limberoller is a flexible steel shaft suspended from a bearing at each end, forming a natural trough and turning on its own axis. The two bearings never require maintenance or greasing and are located clear of the dirt.

Tough, resilient Neoprene covers the steel shaft and a series of moulded Neoprene discs support the belt. Flexibility of the idler centres the load, guides the belt, adjusts automatically to loading conditions and gives a smooth ride.

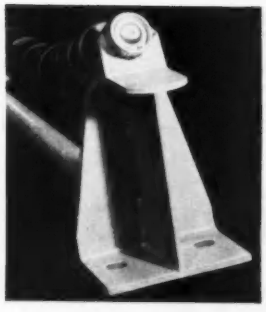
LIMBEROLLER BEARINGS STAY OUT OF THE DIRT

The natural load-carrying catenary of this flexible idler keeps the two bearings up out of the dirt zone. A smooth, 'no-bump' ride reduces spillage and lengthens belt life, and the idlers are long lasting, too — units in service have passed 600 million revolutions, carried nearly a million tons of material without detectable weakening or wear.

Really "sealed for life" Bearings on the JOY LIMBEROLLER IDLER

If there's a place to put grease into an idler bearing then dirt can also enter. That's why Joy Limberollers are sealed up tight for life.

The flexible steel shaft of the Limberoller has swaged shank ends which slip-fit into the inner race of the double row precision ball bearings. A snap ring locks the end in place and a Neoprene wiping seal keeps the grease in, dirt out. A second Neoprene ring and bearing cap held by a snap-ring seals the other end. The outer race, cadmium-plated, forms a cartridge to fit the idler supporting bracket. Bearings are packed with grease of 7-year-plus shelf life, rated for operational temperatures through -35°F to +275°F.



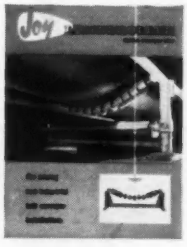
SEVERE RUNNING TEST PROVES THE BEARING

Under normal operating conditions Limberoller bearings rotate at approx. 510 r.p.m. under a belt travelling at 400 ft. per min. Taking the weight of material between two Limberollers as an average of 150 lbs., a force of 47.6 lbs. is exerted acting vertically on the bearing.

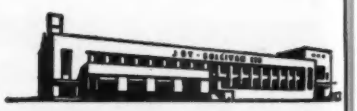
In the Joy-Sullivan laboratory a test rig is running a bearing at a speed of 750 r.p.m. (47% above normal) with a vertical force of 63 lb. exerted (32% above normal). The bearing runs continuously, in a box packed with fine coal dust and sludge. Under these abnormal conditions the bearing has so far passed 310 million revolutions with no detectable weakening.

TAKE 10 ON TEST

Materials handling engineers are testing Limberollers for themselves by installing ten in a tough spot on the belt. They're already delighted with the results — so take a tip and try the Ten Limberoller Test yourself.



Publication No. L.115 contains full technical details of the range of Limberoller idlers — write now for your copy.



JOY · SULLIVAN LTD

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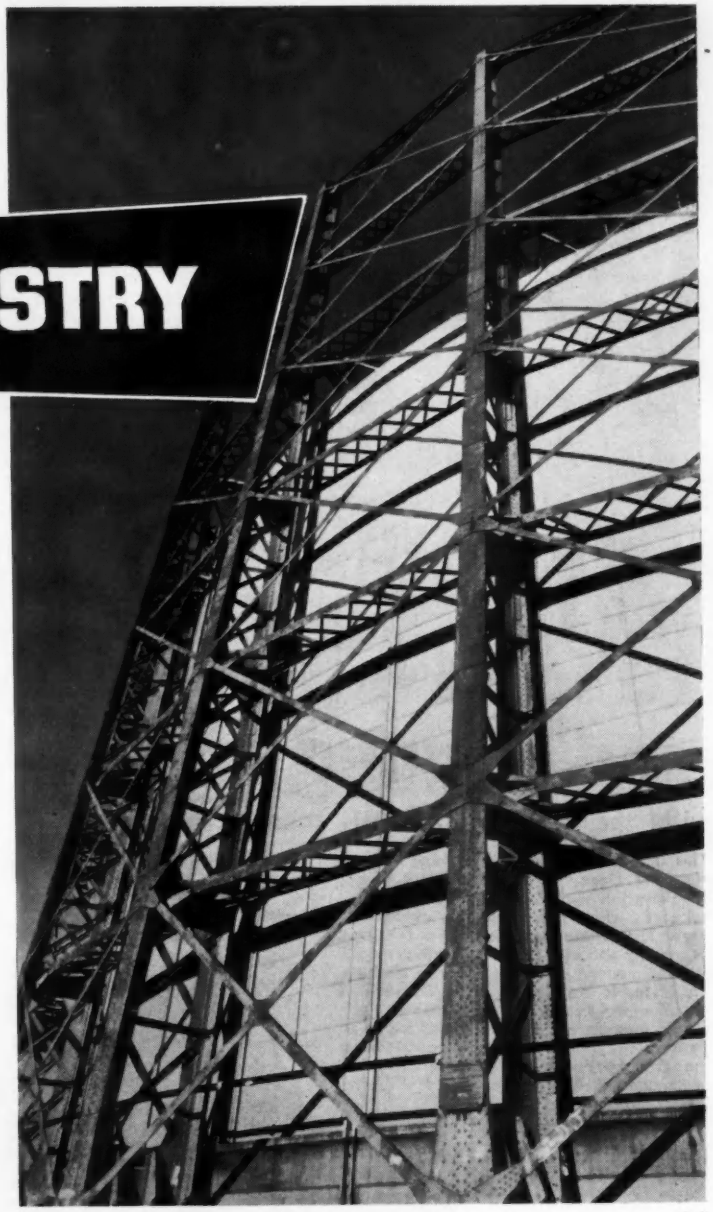
Specialised PAINTS and ENAMELS

for all the needs of the GAS INDUSTRY



For many years, British Paints Limited have maintained a Technical Division solely to study and meet the varied painting requirements of the Gas Industry.

As a result, British Paints Limited are expert in this field, supplying paints, enamels and protective finishes scientifically formulated to satisfy particular purposes—whether for the protection of structural steelwork and gas holders, the decoration of premises, or the stove-enamelling of domestic gas appliances.

Whenever it is a matter of covering *any* surface consult British Paints Limited. Experienced Technical Staff will advise on the spot, if necessary.

Gas Holder, St. Anthony's, Newcastle upon Tyne. Painted with British Paints Limited Alkyd Enamel. Photo by courtesy of The Northern Gas Board.

BRITISH PAINTS LIMITED

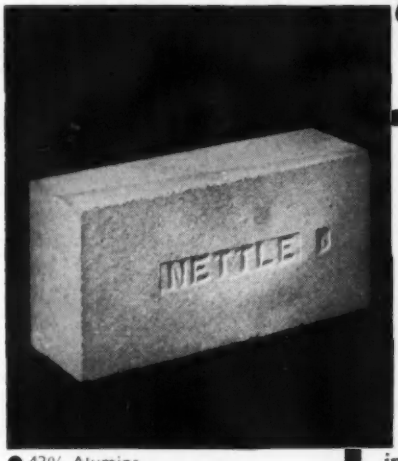
PORTLAND ROAD, NEWCASTLE UPON TYNE, 2

LONDON · SYDNEY · ADELAIDE · TORONTO · DURBAN · CAPETOWN · CALCUTTA · TRINIDAD · NEW YORK

OUR WORLD-WIDE SERVICE IS AT YOUR DISPOSAL FOR THE ASKING

STEIN *Refractories*

NETTLE D



The appearance of Nettle quality firebrick in commercial quantities in 1928 was warmly welcomed by users in all heat consuming industries at home and abroad. Here, at last, was a 42% Alumina firebrick, capable of withstanding the rigours of severe service conditions in all manner of furnaces. The many technical advantages of Nettle were quickly appreciated by users and, over the years, a steadily increasing demand has amply proved its popularity and severely taxed our efforts to meet it.

The more arduous service conditions in furnaces of today—due partly to the increasing use of liquid fuels and also to the constant demand for greater furnace outputs—call for a firebrick of even higher standard. In Nettle D we are confident we have succeeded in meeting this call. Here is a firebrick in which are combined all the desirable properties looked for in a super duty quality.

We are happy to announce that commercial production of Nettle D is now on a continuous basis and from now on we hope to have this quality available in most standard sizes on fairly prompt delivery. Special shapes in Nettle D can also be obtained.

- 43% Alumina.
- Low in fluxing impurities.
- High Refractoriness.
- High under load strength.
- Low Porosity.
- High Bulk Density.
- Low After Contraction.
- High slagging resistance.
- High mechanical strength.

Use our advisory service based on 70 years' experience in the refractory field—it can improve your furnace efficiency. For further information write, phone or call—

Technical Data Sheet gladly sent on request

JOHN G. STEIN & CO. LTD. Bonnybridge Scotland

Tel: BANKNOCK 255 (4 LINES)

20 to 25 tons of coke de-breezed and bagged per hour

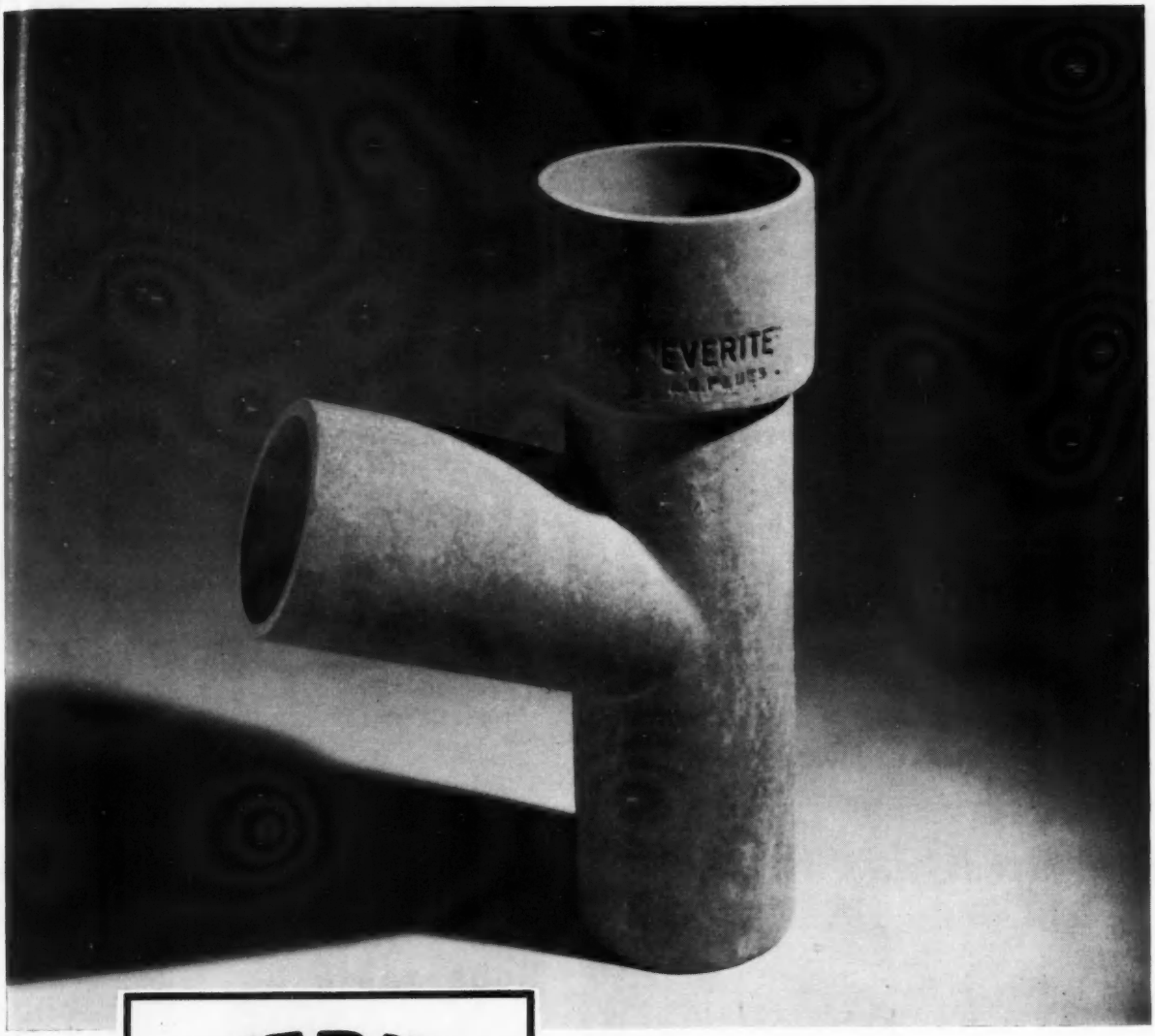
with the SMITH HARMER coke loader

This modern coke loading machine was invented by the head of the Materials Handling Dept. of the Gas, Light and Coke Company and developed in collaboration with Smiths of Rodley. The bucket scoops up about 7 cwt. of coke at a time, separating the breeze and delivering cleaned coke into 1 cwt. bags. The whole operation from the ground pile to the bags is performed as quickly and cheaply as the delivery only from a modern coke hopper. The machine illustrated is capable of handling 20-25 tons of coke per hour. It is available with either pneumatic tyres or crawler tracks as desired. Larger machines are available mounted on crawler tracks and are capable of handling 40-45 tons per hour.

Illustrated leaflet available on request.

Smiths OF RODLEY

THOMAS SMITH & SONS (RODLEY) LTD · RODLEY · LEEDS



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REGD. TRADE MARK

ASBESTOS CEMENT FLUE PIPES
(HEAVY QUALITY)

WE HAVE AN EXHIBIT AT THE BUILDING CENTRE
26 STORE STREET W.C.1

Pipes and fittings available in 3", 3½", 4", 4½", 5" and 6" diameters—also 7" to 12" diameters.

Suitable for use with slow combustion stoves and also for general industrial ducting work etc.

Manufactured in accordance with BS.835/1954.

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A MEMBER OF THE TURNER & NEWALL ORGANISATION
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P10

BUCKLERSBURY HOUSE TO STAND ON 3,500 BORED PILES

This important Office Building in the City of London, 17 storeys high including the basement floors, is supported on Cementation Bored Piles. Approximately 3,500 were constructed well within the contract time despite the fact that delays were unavoidably occasioned by the deliberations on the fate of the Mithras Temple discovered on the site and other major difficulties inevitable on such a large site.

The construction of a surrounding wall to retain the adjoining Queen Victoria Street, Cannon Street and Bucklersbury was greatly facilitated by the use of our bored piles.

The close proximity of important buildings including the Mansion House and services such as the Underground Railway made it necessary to reduce noise, vibration, etc., to an absolute minimum.

The CEMENTATION COMPANY LIMITED

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The latest and best in PORTABLE BELT CONVEYORS

Belt. Of best quality Grade "A" long staple cotton canvas duck with tough rubber cover to suit the duty in question—belt cleated if required.

Support Rollers. All of the ball bearing type with dual synthetic rubber oil and dirt seals and oil reservoir lubrication—return rollers have tough rubber discs designed to clear returning cleats and to assist in keeping the belt clean.

Protection of Working Parts. The motor drives and ball bearings are carefully positioned and really well protected.

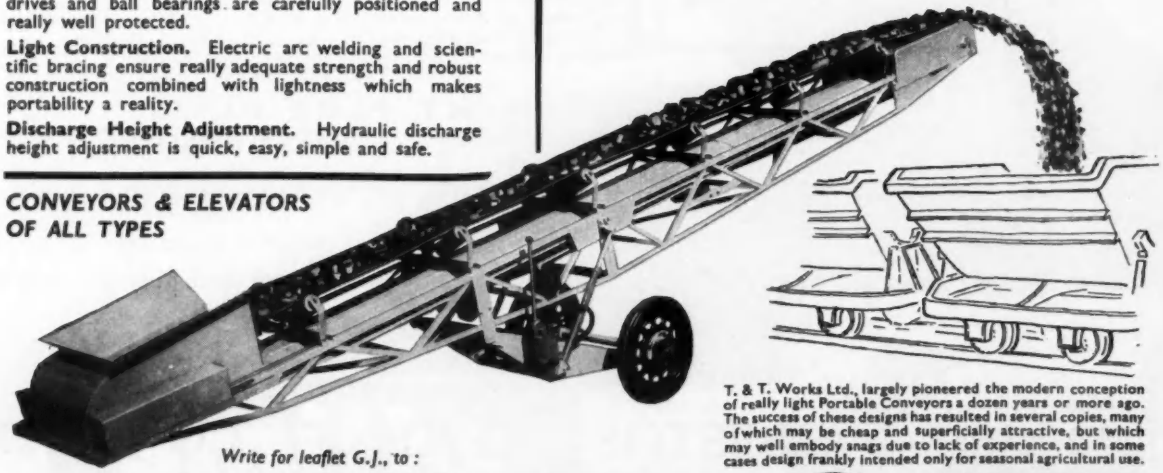
Light Construction. Electric arc welding and scientific bracing ensure really adequate strength and robust construction combined with lightness which makes portability a reality.

Discharge Height Adjustment. Hydraulic discharge height adjustment is quick, easy, simple and safe.

WITH AN

Unbeatable Specification

These conveyors are available in a full range of lengths and widths. Ultra light editions are also made, and are particularly suitable for oxide handling duties.



CONVEYORS & ELEVATORS OF ALL TYPES

T. & T. Works Ltd., largely pioneered the modern conception of really light Portable Conveyors a dozen years or more ago. The success of these designs has resulted in several copies, many of which may be cheap and superficially attractive, but which may well embody snags due to lack of experience, and in some cases design frankly intended only for seasonal agricultural use.

Write for leaflet G.J., to:

T & T WORKS LTD., BILLESDON, LEICESTER.
Phone: Billesdon 261. Grams: Conveyor, Leicester.
London Office: 39, Windsor House, 46, Victoria Street, London, S.W.1. Phone: ABBey 6085.

Save Money and Man-Hours WITH T&T CONVEYORS & ELEVATORS

A hundred years of know how...

At Kirkby Works, every stage of processing copper tubes contributes to the final quality product.

Billets are produced from only the purest metal, while the extensive use of extrusion ensures that shells of the highest quality are fed to the drawbenches.

A century of experience in copper tube making went into designing Kirkby — a great manufacturing unit planned for an even greater future.

I.C.I. COPPER TUBES FROM KIRKBY

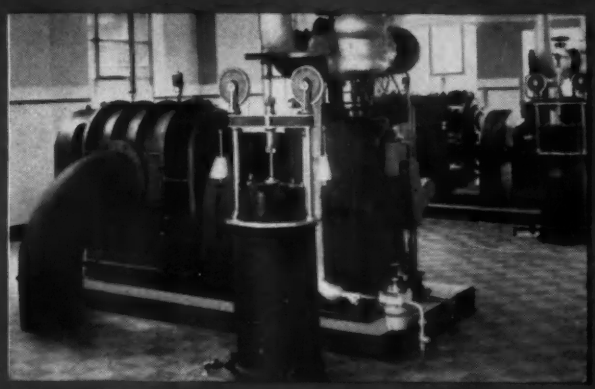
IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.

ICI METALS DIVISION

C.T. 5

WALLER MACHINES AT KINGSTON

For the new Kingston Gas Works in the Isle of Wight, only the most modern, efficient equipment is good enough. George Waller & Son, Ltd., therefore take pride in announcing that the following machines have been installed :—



Two Sets of steam driven Waller Roots Exhausters

Capacity 150,000 cu. ft. per hour, against a total pressure differential of 78" W.G. These are driven by 43 h.p. Sisson engines.

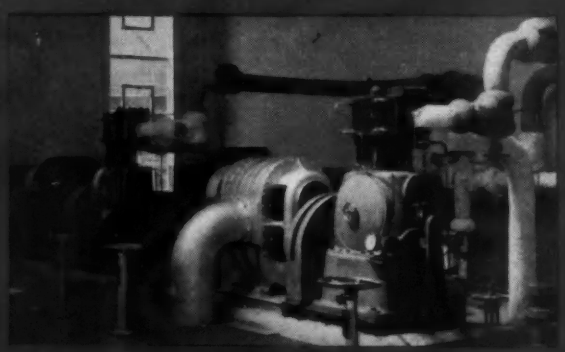
Two sets of steam driven Waller Roots Gas Boosters

Capacity 250,000 cu. ft. per hour. Delivery pressure : 4 lbs. per sq. in., driven by 100 h.p. Sisson engines.

Two sets of motor driven two stage fan-type Boosters

Capacity 100,000 cu. ft. per hour. Pressure increase : 44" W.G., driven by 28 h.p. Lancashire Dynamo Motors.

(Waller fuel discharge filter, complete with screens, storage bunkers, etc., will be installed at the gas works.



GEORGE **WALLER** & SON LTD.

PHOENIX IRON WORKS, STROUD, GLOS.

Telephone : BRIMSCOMBE 2301/2

Photographs by courtesy of Southern Gas Board.

BIRTLEY ENGINEERING LIMITED

a Subsidiary of the Birmingham Small Arms Co. Ltd., IS NOW actively engaged in further developing and expanding the activities acquired from The Birtley Co. Ltd., from which old established Company the specialist design and technical staff have transferred bringing to the new Company the benefits of many years practical experience and technical knowledge of the design and construction of Complete Coal Preparation Plants and Materials Handling Installations.

Projects at present being designed or under construction include :—

for The National Coal Board :
Ollerton Colliery, Dirt Handling, 95 ton/hr. ; Ollerton Colliery, Baum Wash Boxes and Froth Flotation, 350 ton/hr. ; Swadlincote Colliery, Screening and Crushing Plant, 50 ton/hr. ; Askern Colliery, Tromp Washery, 240 ton/hr. ; Welbeck Colliery, Bagging Plant, 75 ton/hr. ; Woolley Colliery, Froth Flotation, 12 ton/hr. ; Warsop Colliery, Tromp Washery, 280 ton/hr.

for The Central Electricity Authority :
Blyth "A" Power Station, Handling Plant, 1200 ton/hr.

and Sampling Equipments for Power Stations at :
Willington, Stella North, Stella South and Blyth A.

also Handling Plants for :
Appleby Frodingham Iron and Steel Co., Coke Handling, 200 ton/hr. ; Woodall-Duckham, Coal and Coke, 200 ton/hr.; North Thames Gas Board, Bow Common Station, Pneumatic Cleaning Plant Extension, 15 ton/hr.

Additionally, proved designs are available of primary and secondary Sampling Equipments capable of providing scientifically and automatically a truly representative sample from a wide range of materials.

BIRTLEY ENGINEERING LIMITED

Birtley, County Durham

BIRTLEY

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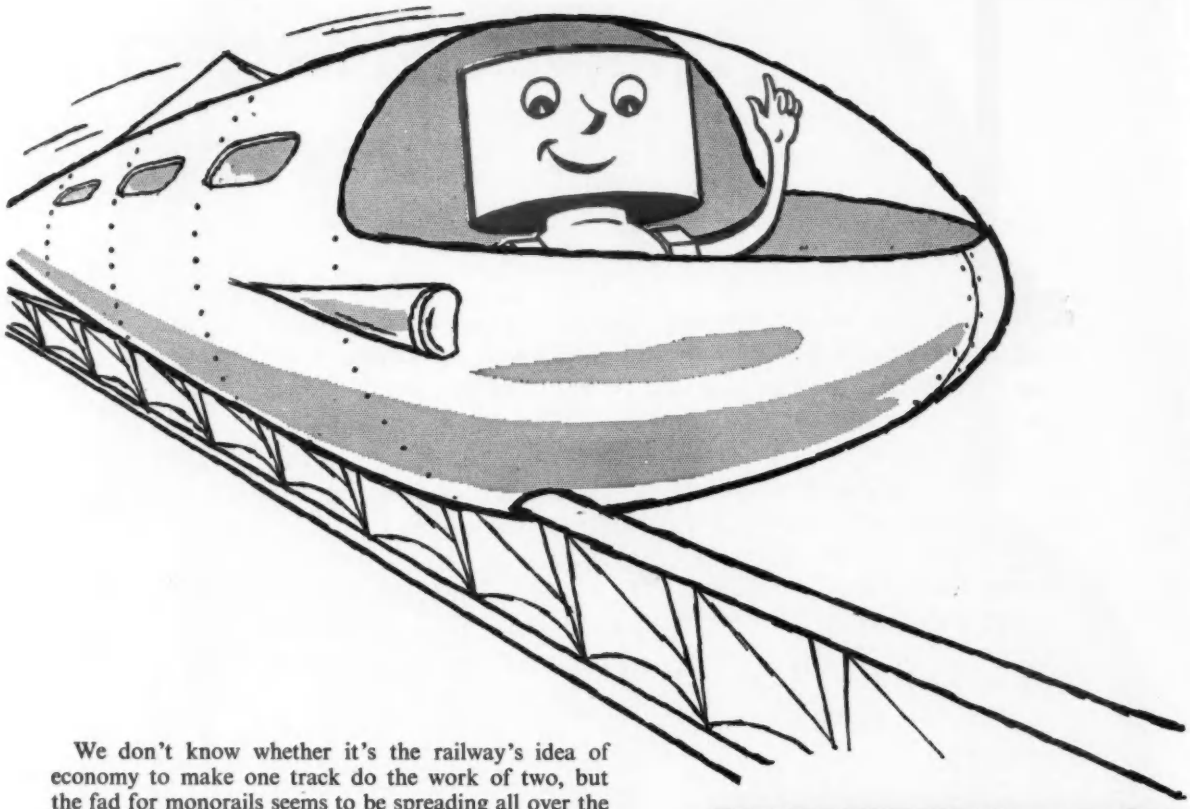
It can't be done without CONTROL



We don't know whether it's the railway's idea of economy to make one track do the work of two, but the fad for monorails seems to be spreading all over the place. They tell us they go faster, smoother, safer, quieter — but we two-footed ancients have an ingrained distrust of anything lacking inherent equilibrium. Of course, it's all a matter of reliable controls — our slide-rule wallahs tell us they are foolproof and safe.

We ought to be able to understand this, for we make much the same claims for Magnetic Valves. Twenty-five years of skill and experience in the business have been used to make Magnetic Valves exercise unfailing automatic or remote control over industrial gases and liquids like air, steam, oil and coal gas. No help is enlisted from glands, driving shafts or stuffing boxes. If you ask us for more details, we will send you illustrated literature showing the standard range. Special valves up to 12 in. orifice can be supplied.

MANY VALVES AVAILABLE ex stock
VALVES DESIGNED for special conditions

THE MAGNETIC "R" TYPE SINGLE BEAT STOP VALVE

The standard valve can be supplied in ¼", ⅜", ½", ¾" and 1" sizes, fitted with Full-way orifice, suitable for controlling the flow of Coal Gas or similar medium at pressures up to 10" W.G., although where necessary this type of unit can be supplied suitable for use with pressures in excess of this. The valve is instantaneous in operation, of "packless" construction and can be fitted with continuously rated A.C. or D.C. operating coils as required. Furthermore, the standard unit is adaptable to either straight or angle pattern. A similar type of valve can be supplied suitable for controlling the flow of Water, Air, Oil or Refrigerants, etc.

THE **Magnetic Valve Company** LIMITED

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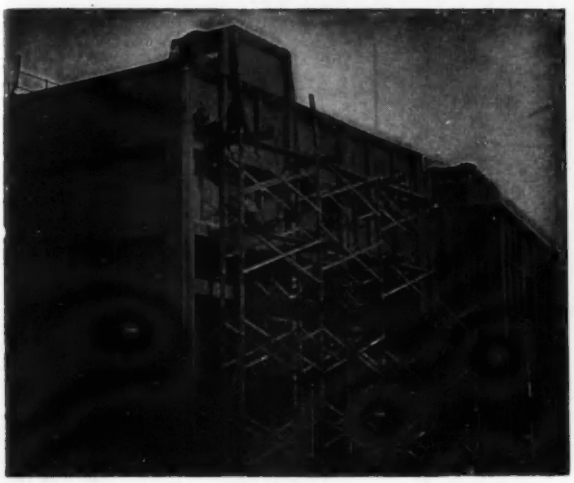
Gunite



One of the reinforced concrete structures reconditioned with Gunite for the City of Carlisle Gas Undertaking

Gunite—concrete applied by air pressure—has numerous applications where its great density and extreme adhesion have exceptional value.

For repairing reinforced concrete it has particular merit, as, due to the method of application, a uniform density and adherence is obtained whenever Gunite is applied.

For lining coal bunkers and steel chimneys it possesses great resistance to corrosion and protects steel-work from the abrasive action of coal or coke.

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Telephone : Victoria 7877 & 6275

THE CONCRETE PROOFING CO., LTD.

Handbook "GUNITE" sent on request

FOR EFFICIENCY– *Always*

BRITISH ALCOSA PRODUCTS

BRAZING EQUIPMENT

BLOWPIPES

Available in sizes ⅜", ½" and ¾" and designed to operate with air pressure of 1 lb. per sq. in. approx., and Town Gas at 3" w.g. "Compoflex" for Gas and air supplied as necessary. Illustrated (left) is Model B.2106TC with twin cock control and (right) Model B.2106SL; and improved design with single lever automatically proportioning gas and air.

B.2106TC B.2106SL

MOTORIZED POSITIVE PRESSURE BLOWERS

Designed expressly for Blowpipe operation, these self-contained units, with three phase or single phase supply, are made in three sizes, ESP0, ESP1 and ESP2. Model ESP0 operates eight ⅜" Blowpipes. Larger models made to customers requirements.

ESP0

REVOLVING BRAZING HEARTHS

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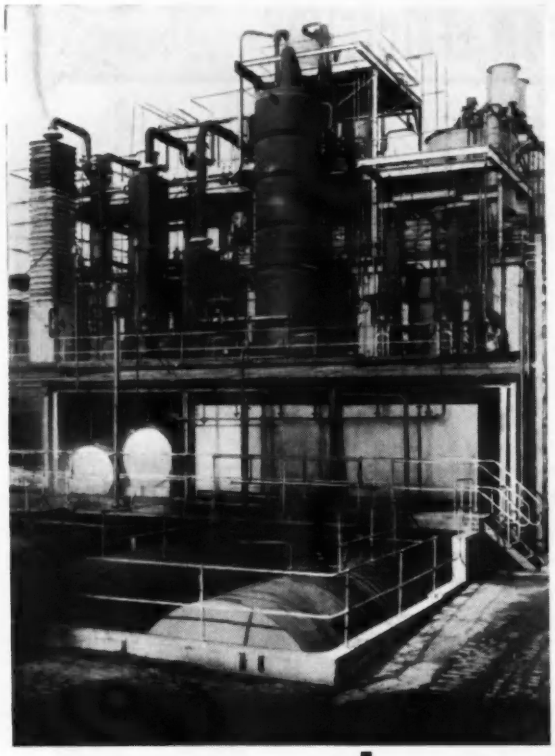

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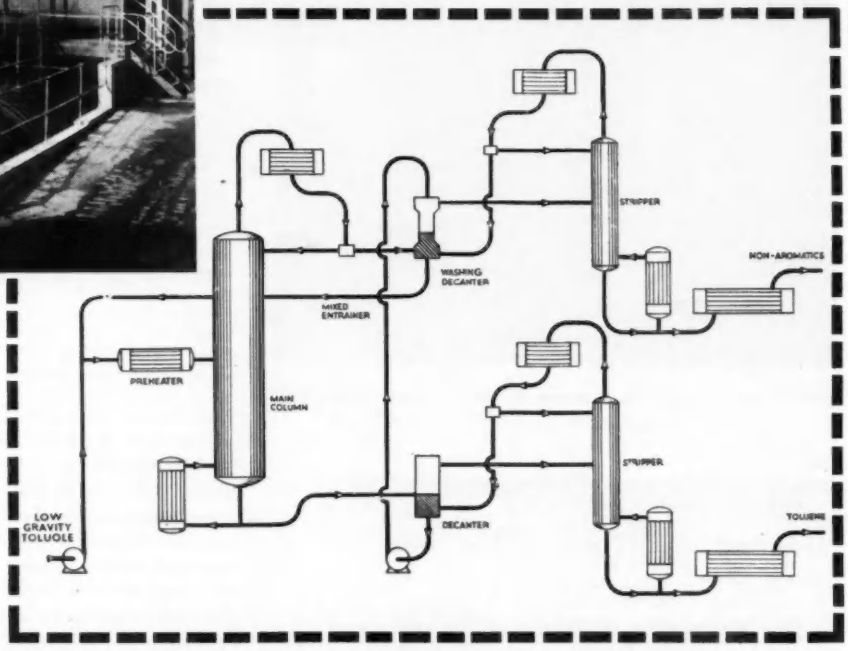

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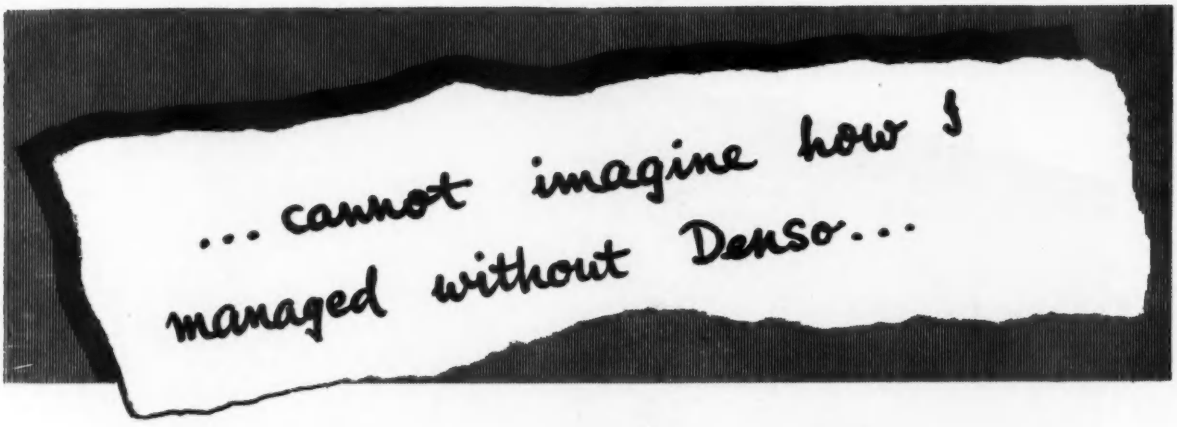

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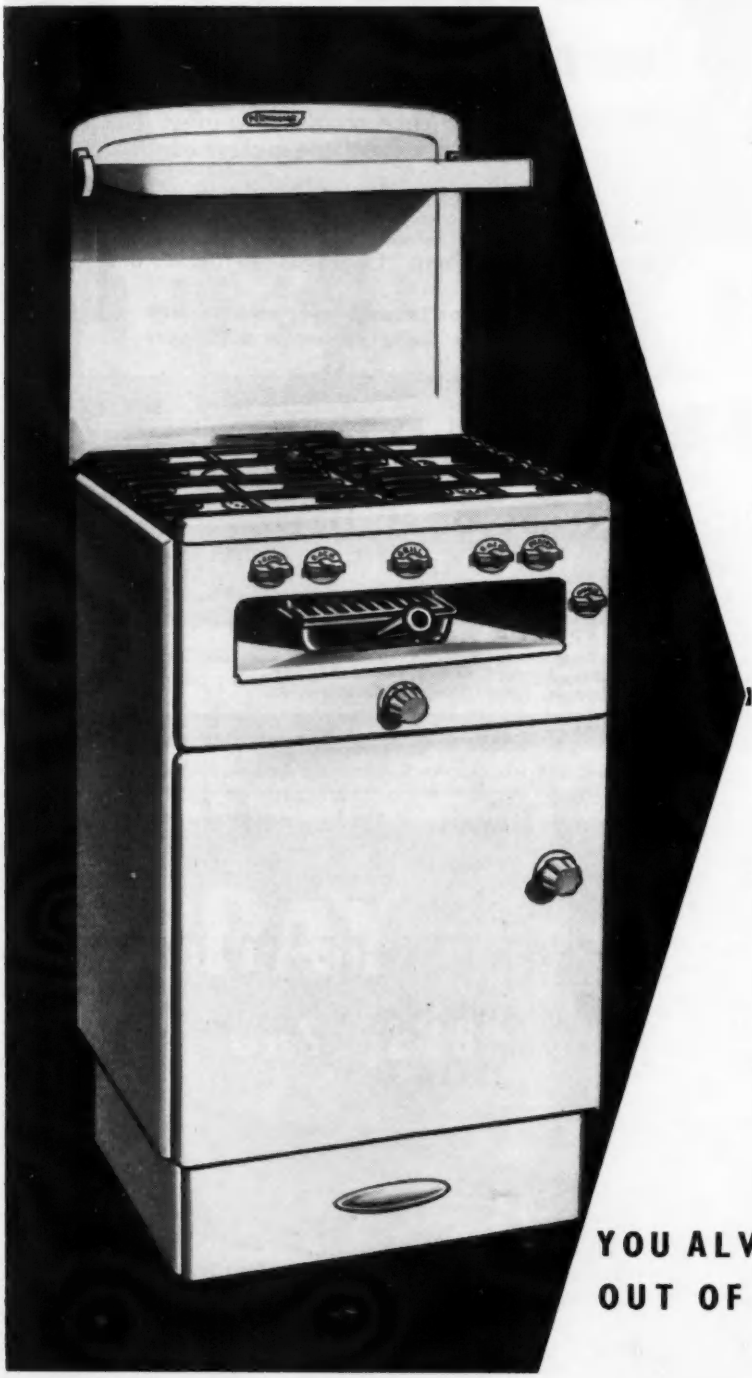

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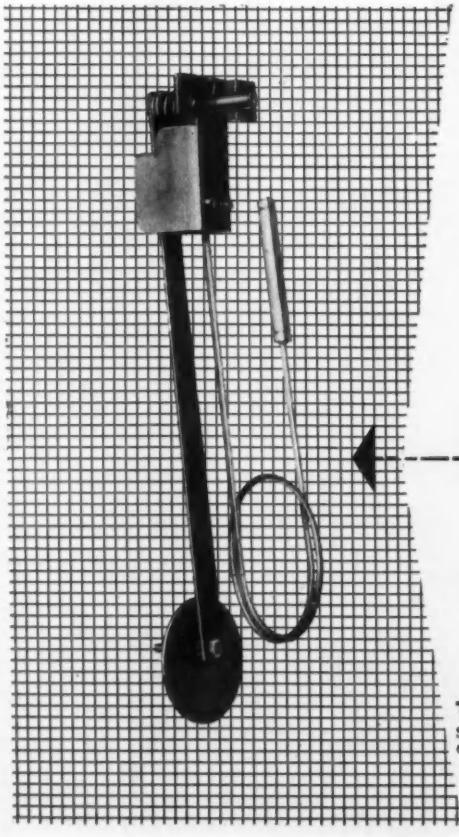

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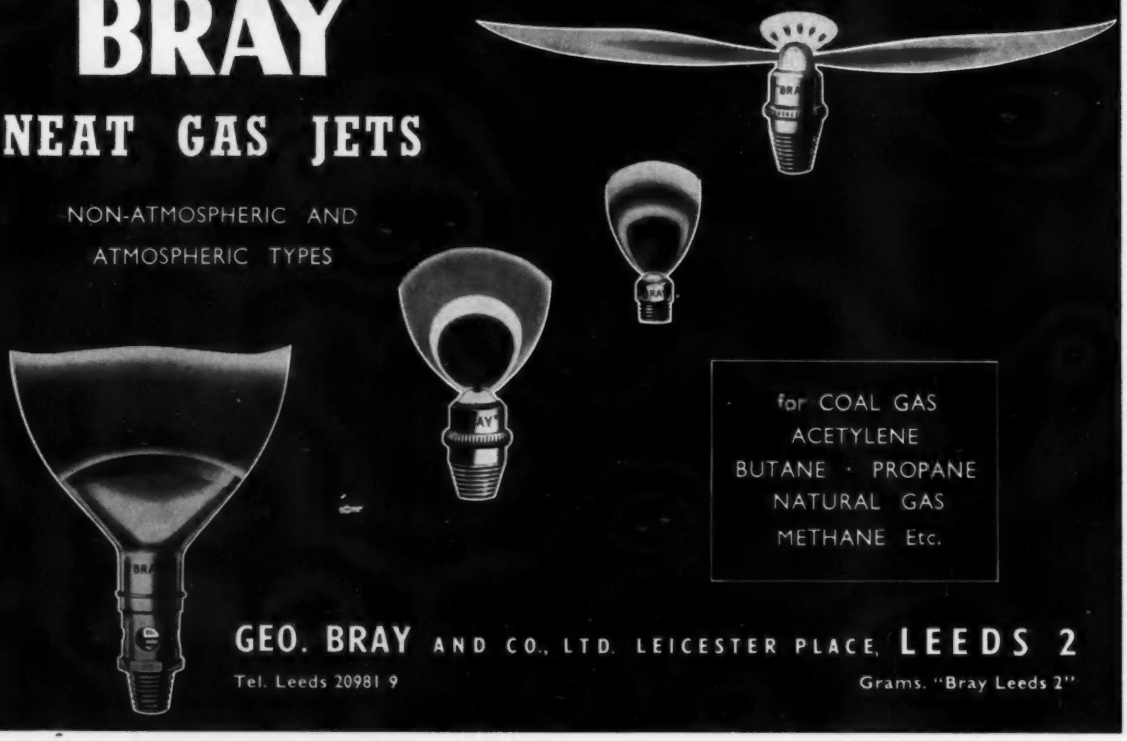

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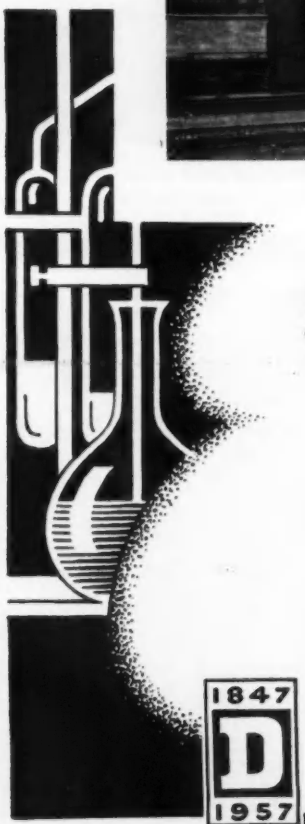

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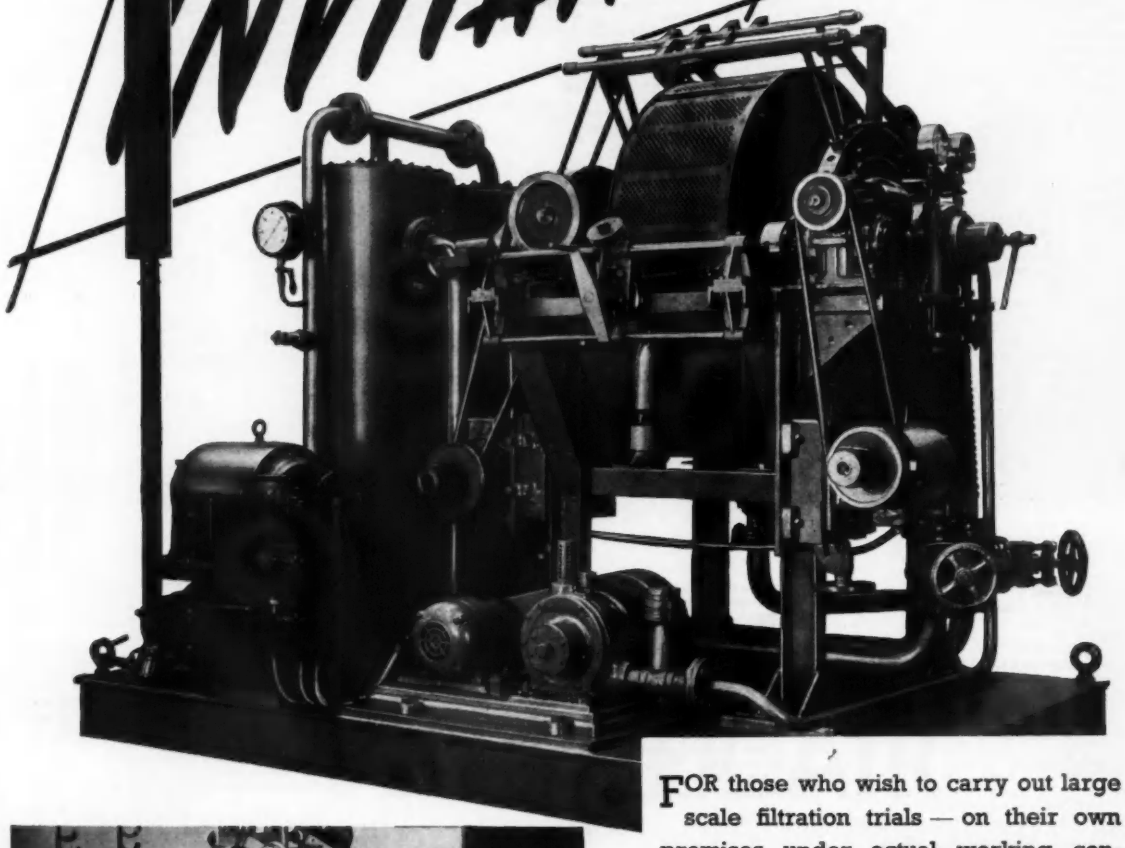

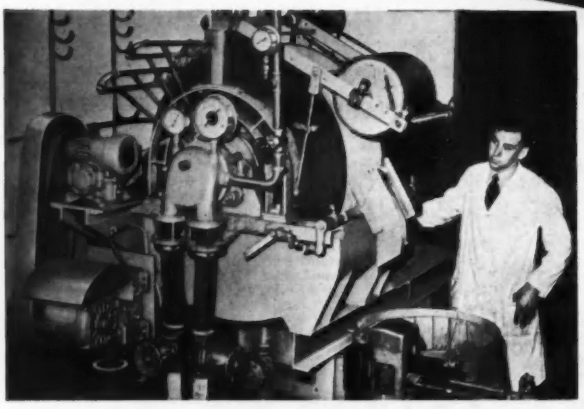

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Gas Journal

VOL. 290 *NO. 4900* *June 12, 1957*

109TH YEAR

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Gas Journal

VOLUME 290. No. 4900. JUNE 12, 1957. 109th YEAR

Gas in Scotland

IT is perhaps because the production and distribution of gas in Scotland presents a problem more difficult of solution than elsewhere in Great Britain, except possibly in Wales, that it has for us a special interest. And it is because of this interest and the fact that plans are developing rapidly in the area that we are publishing in this issue an abstract from the paper by Mr. T. S. Ricketts to the Scottish Gas Board's conference at Perth and an account of some of the new carbonising plant either commissioned or building in Scotland.

The former sets out in some detail the present and future policy for gas production and distribution being pursued by the Board. Perhaps the first thing to be considered is one of terraine and the uneveness of the distribution of population; second consideration is the great administrative difficulties which are caused by the extensive areas over which some of the divisions have jurisdiction, and the third consideration is the source and method of gas-making and the way in which means outside the conventional methods of carbonisation may be made use of.

The population of Scotland is concentrated in an industrial belt which is at its densest round Glasgow and the Clyde, extending eastwards and north eastwards towards Edinburgh and Stirling, thinning out as it goes. A minor industrial area occurs in Fife and extends across the river Tay to Dundee. Although the largest gasworks in Scotland is to be found at the Granton works near Edinburgh, the area of large gas consumption has really spent itself before it has reached the outskirts of Lanark. In this area 80% of the gas produced in Scotland is consumed. Gas arrived in Scotland about the same time as it did in England and was manufactured at a great many small works, many of which were later taken over by the local municipality—to a greater extent perhaps than in many parts of England. Outside the central industrial belt many of these undertakings are remote and far from their neighbours. This makes the linking up of such small and generally uneconomic undertakings difficult, and, apart from the distances to be covered, the small amount of gas to be transported and the absence of loads or districts to be exploited *en route*, the chances of increased gas demand in these country districts is extremely improbable. In districts which are on the outskirts of centres of population, it has been found possible to extend a supply to small villages and close down their gas-making plant. This has been done near Kilmarnock, which is on the edge of the Glasgow industrial area with a growing industrial load of its own. By laying mains to the east and south east, seven small undertakings are being supplied from the enlarged works at Kilmarnock. This will also be possible in the Lothians by laying a main eastward from Edinburgh and along the Fife coast with a supply from Dunfirmline. In the more remote areas local interlinkages may be possible and, where possible, are being carried out. Such interlinkages may be seen in the Border Country round Galashiels and in the Northern Division near Elgin where a number of small undertakings are being interlinked. Elsewhere there are remote undertakings where even a local interlinkage does not appear to be economically possible. Examples of these are to be found at Dumfries in the south and Peterhead in the north. At both of these places the carbonising plant has been brought up to date recently by the installation of modern continuous vertical retorts, and these undertakings are examples of how a medium sized works may be modernised and be equipped with modern methods of mechanical handling and waste heat recovery.

The Scottish Gas Board has gas-making plant in Orkney, Shetland and the Outer Hebrides. Such undertakings will remain unchanged except that they are being administered by the headquarters of the Northern Division at Aberdeen.

The administrative problem that faces the Scottish Gas Board is one of considerable magnitude. It is worth remembering that the total area for which the

Board is responsible covers some 30,000 sq. miles with a total population of about 5 mill. and a gas output of 202.3 mill. therms, whereas the total area of gas supply in England without Wales is some 50,000 sq. miles, with a population of about 41 mill. and a gas output of 2,265 mill therms. The area of supply of the English gas boards is only about 1⅔ that of Scotland, with a population eight times and a gas output more than ten times as great. England, however, is divided into ten area boards.

In order to improve the administration of this large area certain changes have taken place by which the administrative areas have been reduced from ten to four. The four divisions so formed are administered by divisional general managers responsible to the Board. By this means the Board can more easily control the larger divisions, reduce administrative costs, and encourage the greater concentration of gas-making and the supply of gas by integrated grid wherever possible.

The policy of the Board is to make full use of every means of gas production and to transport this gas by means of integrated grid systems wherever possible. To get some idea of how far this policy is being carried out, it is interesting to note that of the 196 gas-making plants in Scotland, at nationalisation, 52 have now been shut down. By the beginning of the financial year 1962-63, production will have ceased at a further 69 works, and at 14 more in the following five years. Of the 61 works left in 1967, the Board plans to have 12 works with an output of 2,000 mill. cu.ft. per annum or above, 25 major works with an output between 2,000 and 300 mill. cu.ft. per year, four of about 300 mill. cu.ft., with the remaining 36 works in remote districts beyond any integration scheme. To do this it will be necessary to make use of all sources of gas and all types of gas-making plant. Coke oven gas is available in the Glasgow Division and has been purchased by the Board for some years (in fact there was a coke oven gas purification plant specially built to deal with such gas before vesting day). More of this gas is likely to become available in the near future as more coke ovens are built by the steel companies in the West of Scotland; it should amount to some 30 mill. cu.ft. per day. Other sources of gas will include methane from coal mines, liquid methane imported from abroad, and natural gas from the Cousland well near Edinburgh. Other possible sources of gas might include large-scale oil gasification and the high pressure gasification of the poorest quality coal by the Lurgi process. Since the production of gas by the Lurgi process must be on a large scale to be economic, such a plant, processing the very inferior coal lately discovered in the Fife coal field, would make it possible to concentrate production near Markinch and to close down all other production in Fife and as far afield as Dundee, Perth, and Alloa. If such a project were to be realised, there would arise the problem of the production of smokeless fuel. Certain production stations would have to be kept in being for the purpose of carbonising coal for its production. Underground storage would also be necessary. The natural gas well at Cousland, when exhausted, could be used for this purpose. Finally, the conception of a super grid system in steel tube operating at a pressure of 200 lb. per sq. in. to reinforce the Western Grid in the Glasgow area and the Eastern Grid in the Edinburgh-Fife area is being studied by the Board.

This would involve imported methane processed at Dumbarton, oil gasification at Grangemouth as well as the Lurgi plant.

The Scottish Gas Board realise that some very revolutionary methods may have to be used if it is going to compete with electricity. In many places the electricity boards have offered preferential terms for bringing power to new housing estates; terms which make it almost impossible for the council building the houses to refuse to accept electricity at the expense of gas. If such means of displacing gas are resorted to, the Board are determined to redouble their efforts to sell more gas at a competitive price and to put all possible stress on the service they are prepared to offer. To do this, it will be necessary to overhaul the production and supply of gas to all those already connected and to future consumers to make certain that the pressure of gas is always what it should be at the cheapest possible price. This is a very formidable task, but the Board appear to be equal to it. The headquarters staff have every appearance of preparing themselves for the problems ahead the determination to make failure impossible.

W.G.F. Annual Meeting

A VISIT to the Central Hall, Westminster, on June 4 brought a reminder of the continuing growth of the Women's Gas Federation. At their A.G.M. it was reported that membership now stands at 15,250, an increase of more than 2,000 over the previous year, and the fact that all these women throughout Britain have been in close contact with the work and developments of the gas industry suggests a potent publicity medium. Another noteworthy figure was the increase of 200% in the number of students entering the Federation's examination for students of housecraft. Miss K. M. Halpin, the President, neatly summed up the work of the W.G.F. when she said: 'We don't want a mothers' meeting or a bunfight but a forum of intelligent home makers.'

In addition to the Chairman and Deputy Chairman of the Gas Council, and several area board chairmen, the guests included Dr. R. S. Andrews, Chairman and Managing Director of the Gas and Fuel Corporation of Victoria, and the author of an outstanding paper at the Institution Meeting last month; with him was Mrs. Andrews who, appropriately enough, is President of the W.G.F. in Melbourne. Principal speaker was Professor Arthur Newell, M.A., holder of the John Gilbert Winant Lecture-Fellowship, who talked brilliantly on 'Anglo-American Relations.'

One of the concerns of the Federation is that of safety in the home. Commenting on this, Sir Harold said: 'The gas industry's aim is to make sure that every appliance it markets is as safe as human skill can make it. As you may know, for some years now the Gas Council has published annually a list of approved and tested appliances. Every piece of equipment included in that list has undergone rigorous tests in our laboratories and all the appliances sold in gas showrooms have passed these tests. The householder, therefore, can be confident that the gas cooker, water heater, fire or other appliance he or she purchases will prove safe, as well as efficient, in action. We cannot, however, control the sale of secondhand appliances, and every purchaser of this kind of equipment would be well advised as a matter of commonsense to ask the advice of his gas board before he has the appliance fitted in his home.'

Personal

SIR CHARLES BRUCE-GARDNER, Bt., has been elected President; MR. L. L. J. WALKER, Chairman; and MR. S. N. TURNER, Vice - Chairman of the Society of British Gas Industries for the year 1957-58. Sectional Chairmen are—Retort settings, MR. F. P. DYSON; condensers, washers, and purifying plant, MR. I. M. O. HUTCHISON; mechanical handling plant, MR. M. S. GASKILL; gasholders, MR. J. S. CHRISTIE; gas meters, MR. N. L. SMITH; gas cooking and space heating equipment, MR. A. F. OATLEY; gas lighting equipment, gas fittings and burners, MR. W. H. TILLEY; manufacturers and contractors for gasworks not included in the foregoing and following, MR. A. E. WATKINS; industrial gas equipment, MR. N. VAN MARLE; refractory goods, MR. D. C. MUIR; exhausters, boosters and compressors, MR. H. WHITELEY; chemical and by-product plant, MR. S. B. RIPPON; water gas and producer gas plant, MR. J. E. TULLY; gas wash boilers and washing machines, MR. J. C. RAISBECK; pipes, tubes and fittings, MR. J. A. WOOD; gas water heaters, MR. P. D. M. AIRD; scientific instruments, MR. L. B. LAMBERT; coke ovens, MR. J. SIMPSON. Elective Members are COL. W. E. GIBBONS and MR. F. P. S. STAMMERS. Ex Officio Members, MR. W. D. KING, Hon. Secretary, and MR. E. WEST, Hon. Treasurer.

Gastronomic Festival

THE International Gastronomic Festival, held in Torquay last month, was organised in conjunction with the International Academy Chefs de Cuisine and the South Western Gas Board, and was sponsored by the British Hotels and Restaurants Association, the Hotel and Catering Institute, the Wine and Food Society, the Regional Council for Further Education for the South West, and with the support of local Chambers of Trade and Commerce and Hotels and Catering Associations. Mr. W. Freer, the Board's Commercial Assistant at Torquay, is the Honorary Secretary, while Mr. J. W. Denton, the Torquay-Exeter Divisional Manager, also serves on the Council of Management.

The construction of all the Festival exhibition's stands and the décor was the work of the South Western Gas Board's Display Department, and in particular of Mr. Ron Aunger, who has served the Festival since its inception.

Long Service Awards

Among 36 members of the staff of Humphreys and Glasgow, Ltd., who received gold watches on June 5, to mark 25 years' service, or longer, were both Joint Managing Directors, Mr. G. Helps and Mr. G. G. Farthing, a senior draughtsman, Mr. L. P. Brooke, and a member of the secretarial staff, Miss Loudon.

MR. HENRY S. WINGATE, President of the International Nickel Co. of Canada, Ltd., has received the honorary degree of Doctor of Laws.

Obituary

MR. CHARLES F. BOTLEY, who was President of the Institution of Gas Engineers in 1926, has died aged 87. When Mr. Botley retired in 1940, he was Engineer and General Manager of the Hastings and St. Leonards Gas Company. He had joined the Company as assistant to his father in 1891. He was President of the Southern Association of Gas Engineers and Managers in 1920. Mr. Botley became a member of the Institution in 1899.

MR. JAMES WILSON BEVERIDGE, of Troon, has died in Kilmarnock at the age of 68. He was Assistant Manager with the Gas Company at Airdrie and then at Pontefract, before going to Troon in 1923. He was Manager of the Troon Corporation gasworks from 1923 until nationalisation, and continued in this capacity with the Scottish Gas Board until his retirement in 1954.

Analytical Chemistry Congress

THE Congress on Analytical Chemistry in Industry organised by the Scottish Section of the Society for Analytical Chemistry will be held at St. Andrews on June 24 to 28.

The Congress programme, recently published, has been designed to bring into focus the developments of analytical chemistry in the light of three major changes in chemical science. These are the increase in general understanding of chemical interactions, the development of instruments for measuring chemical reactions in terms of physical quantities, and the change in industrial processes in the use of continuous operations and automatic control.

Electro-Chemistry

The subject of a recent meeting of the Physical Methods Group of the Society for Analytical Chemistry was electrochemistry, and the Chair was taken by the Chairman of the Section, Dr. J. E. Page.

Papers presented and discussed were: 'Coulometric Titrations with an Integrated Current Source,' by L. E. Smythe (Australian Atomic Energy Commission) and presented by G. W. C. Milner (U.K.A.E.A., Harwell); and 'Pulse Polarography,' by A. W. Gardner (U.K.A.E.A., Harwell).

Diary

June 13.—MIDLAND JUNIORS LADIES' DAY: Ringwood Hall, 12 noon. Visit to works of the Staveley Iron and Chemical Co. Ltd., near Chesterfield.

June 14.—SCOTTISH G.C.C.: Scottish Gas Board, 26, Drumsheugh Gardens, Edinburgh, 2.30 p.m.

June 14.—SCOTTISH WESTERN JUNIORS ANNUAL GOLF OUTING: Cardross Golf Club, 1.30 p.m.

June 15. — LONDON AND SOUTHERN JUNIORS SUMMER VISIT AND LADIES' DAY: Visit to Portslade Works. Motor-coach tour to Parham Park.

June 15.—EAST OF SCOTLAND JUNIORS: Annual Outing, starting from Edinburgh.

June 15. — LONDON AND SOUTHERN JUNIORS: Brighton. Ladies' Day.

June 20.—NORTHERN JUNIORS A.G.M.: Tynemouth, 2.30 p.m.

June 20.—MIDLAND JUNIORS: Ladies' Day.

June 22. — WESTERN JUNIORS: Ilfracombe. Summer Meeting and Ladies' Day.

June 25.—LONDON AND COUNTIES COKE CIRCLE. Visit to Watson House Centre.

June 26.—THE INSTITUTION OF GAS ENGINEERS, SOUTH WESTERN SECTION: Summer Meeting and Ladies' Day.

ROAD TAR USERS HOLD MEETING

A MEETING organised by the United Coke and Chemicals Co., Ltd., in association with the British Road Tar Association recently, was attended by those interested in the use of tars for road construction and maintenance work in Cumberland, Westmorland, and South - West Scotland.

Mr. F. L. Broughton, Cumberland County Surveyor, was in the chair, and Mr. B. W. Butler, his Penrith Divisional Surveyor, spoke on 'The effect of Bulk Stone Laying on a Divisional Surveyor's Work.'

Others present included Mr. R. T. Hayes, Commercial Manager of the United Coke & Chemicals Co., and Mr. W. E. Cone, Technical Adviser of the B.R.T.A.

Record Attendance

The record number of 750 delegates attended the 1957 National Industrial Safety Conference, organised by the Royal Society for the Prevention of Accidents, held at Scarborough from May 31 to June 2, under the Chairmanship of Mr. Albert Elson, M.B.E., who until his recent retirement was Industrial Safety Consultant to Samuel Fox & Co., Ltd.

Bournemouth Win S.G.B. First Aid Competition

THE Southern Gas Board's area first-aid competition was held in Southampton recently before a large audience of employees, their families and friends. Ten teams competed to represent the Board in the gas industry national first-aid competition in London later this year. The winners were Bournemouth, followed by Sherborne, Southampton, and Reading.

The team test, judged by Dr. W. J. Crawford of the North Thames Gas Board, was based on a realistic mock accident in which a middle-aged employee, suffering from an insulin overdose, fell off a ladder and sustained multiples injuries. The individual tests were judged by Dr. Gunn, Chief Medical Officer of the North Thames Gas Board, and competitors were asked to treat a scalded leg, fractured patella, asphyxia from drowning, and fractured ribs.

Mr. C. H. Leach, Chairman of the Board, said he was delighted to report that their first-aid effort was expanding. Two more teams competed than last year and two more St. Johns divisions had been formed within the Board. Their medical and nursing staff had been increased.

Board's Interest

This all indicated the importance the Board attached to its medical and first-aid services—and benefits were shown by less absenteeism, fewer accidents, and a feeling of all-round general welfare.

It was particularly encouraging to see a young team from a small unit, Sherborne, do so well and he congratulated them on the hard work they had put in to gain second place to the excellent team from Bournemouth.

Dr. M. B. Carson, Chief Medical Officer, Southern Gas Board, thanked all who had assisted his staff in the organisation of the competition, and introduced Mrs. C. H. Leach who presented the winning team with the challenge shield, and individual prizes to all members of the first four teams.

Yorkshire Juniors Visit Steel Works

SOME 35 members of the Yorkshire Juniors, with their President, Mr. R. H. Anderson, recently visited the works of the Consett Iron Co., Ltd., at Consett, Co. Durham, where they saw iron and steel being produced, coke ovens in operation, and bricks and refractory cements used for coke ovens and gas works.

The Consett Iron Co., Ltd., is the present-day development of the Derwent and Consett Iron Co., Ltd., earlier the Derwent Iron Company, formed in 1840 to produce iron from local iron ore deposits in conjunction with the high-grade coking coal underlying the area.

The Fell coke ovens, adjacent to the steelworks, produce more than 1 mill. cu.ft. of gas per hour which, after passing through the by-product plant is used for heating the ovens, for steel melting and re-heating, and is also supplied to the Northern Gas Board's Shotley Bridge works where it is purified and distributed in the Consett area.

After the tour the party were entertained to tea by Mr. G. M. Nave, Director. Mr. R. H. Anderson expressed the visitors' appreciation and thanks.

Gas in France Annual Meeting

THE 74th Congress of the Association Technique de l'Industrie du Gaz en France will be held at Bordeaux from June 11-15.

The Presidential Address will be delivered by M. Georges Nérot to be followed by the first of 40 technical communications.

Members and their ladies will be welcomed by the Deputy Mayor of Bordeaux, and visits to industrial and technical establishments and an all-day excursion through the wine-growing region of the Médoc have been arranged. The congress will be formally closed at a reception at Arcachon by the Regional Direction of Gas Distribution of Gaz de France of Bordeaux.

SIX GAS WORKERS GET B.E.M.

THE British Empire Medal was presented to six gas workers at a recent Lancaster House, London, investiture by the Minister of Power, Lord Mills. A seventh medallist in the New Year's Honours List, Mr. Arthur George Elliott, a skip hoist operator at Southampton, was prevented by illness from attending.

Recipients of the medal were: Mr. R. V. Jarvis, pipe fitter, Wolverhampton District, W.M.G.B.; Mr. W. H. Ball, premises supervisor, Birkenhead, N.W.G.B.; Mr. C. V. Climo, works foreman, Bodmin, S.W.G.B.; Mr. J. W. Mills, Manager, Wooler undertaking, N.G.B.; Mr. F. E. Wright, gas fitter, Loughborough, E.M.G.B.; and Mr. H. Evans, Manager, Newtown undertaking, Wales Gas Board.

Informal Meeting

Sir Harold Smith, Chairman of the Gas Council, met the medallists informally at Gow's Restaurant before departing for another engagement, and Sir Henry Jones, Deputy Chairman, presided over dinner. Lady Jones accompanied him and other Gas Council officers present included Mr. F. G. Brewer, Secretary, and Dr. Alfred Badger, Industrial Relations Officer.

After Sir Henry had described their achievements in a pleasant speech, Mr. Harold Evans expressed thanks on behalf of the medallists. The evening was concluded with a visit to the Whitehall Theatre.

N.Z. Gas Take-over Terms Fair, says Company Chief

'THE Report of the Electricity and Gas Co-ordination Committee in which, as was expected, most of the gas undertakings of the Dominion were declared "essential" by the Minister in charge of the New Zealand State Hydro-electric Department, and which we have reason to believe has been accepted by the Government, would be quite fair to our shareholders,' Sir Charles Norwood, Chairman of the Wellington Gas Co., Ltd., told shareholders at the annual general meeting in Wellington earlier this year.

Permissive legislation empowering electric supply authorities to purchase gas undertakings by mutual agreement had been enacted in October, the chairman added. Negotiations between the Company and the Wellington City Council had proceeded during the year, and further discussions would be held.

After payment of the interim dividend on Ordinary shares and the year's dividend of 5% on Preference shares, and providing for taxation, and depreciation of plant, buildings and machinery, the balance to the credit of profit and loss appropriation account amounts to £68,387, the annual report shows. A further dividend of 3% (making 6% for the year), absorbing £8,364, is recommended, leaving carry-forward of £60,023.

NEW LANCASHIRE DYNAMO COMPANY

Lancashire Dynamo Holdings, Ltd., announce the establishment of a Company to be known as Lancashire Dynamo Group Sales, Ltd., with headquarters at St. Stephen's House, Westminster, London, S.W.1, to take over the sales organisation in Great Britain, previously operated by the various Companies in the Lancashire Dynamo Group. It will also co-ordinate the Group's export sales activities.

Mr. Stanley F. Steward, C.B.E., is Chairman of the new Company and the other members of the Board are Mr. F. H. Schroeder and Mr. H. G. Carter.

EASTERN SECTION Annual General Meeting

Skegness Atmosphere *Was* So Bracing

Good Discussion on Electricity Paper; Bright Prospects for the Coming Year

A CHAIRMAN'S address of rare conciseness and a technical paper that evoked controversial and therefore worthwhile discussion; the installation of a new chairman with the wit, popularity and competence to guarantee yet another sparkling year's events—these were the hallmarks of last week's two-day Eastern Section meeting of the Institution of Gas Engineers at Skegness.

Perhaps it was the traditionally bracing air that brought about the hour-by-hour success of this meeting. But some of the explanation was touched upon by one of the speakers at the luncheon: 'Each chairman, as he comes into office, implants upon the organisation his own personality, and his own originality of thought.'

At Fault?

Certainly, the unassuming personality of Mr. R. C. Wardell, Chairman for the past year, sugar-coated the mixture of business and pleasure so that the two were seldom divisible.

The regret that one inevitably feels when a chairman terminates his year of office was softened to some extent this year for in introducing the new Chairman, Mr. D. B. Parkinson, Mr. Wardell pointed out that the Section was '. . . possibly at fault for having allowed him to escape this office so long.' He added that he was sure that members would give him the same friendly encouragement they had showed to him.

Other officers for the ensuing year are: Senior Vice-Chairman, Mr. S. E. Balsom; Junior Vice-Chairman, Mr. R. J. Gavin; Honorary Secretary and Treasurer, Mr. J. Hunter Rioch; ordinary members of the Management Committee, Mr. D .W. Ault and Mr. S. H. Stokes; Auditors, Mr. A. W. Mather and Mr. H. H. Redwood.

Councillor J. H. Edwards, who is Chairman of the Skegness Urban District Council, welcomed the Section to Skegness during its business meeting, and the Chairman had a welcome for Mr. J. H. Dyde, Deputy Chairman of the Eastern Gas Board, Mr. E. W. Prior, Principal, Gas Division, Ministry of Power, and Mr. F. L. Atkin, Chairman of the Midland Section.

Apologies for absence were read from the President of the Institution, Dr. J. Burns, the Chairman of the East Midlands Gas Board, Mr. R. H. Johnson (who was at lunch the following day), the Chairman of the Eastern Gas Board, Sir John Stephenson; and Mr. Owen Francis, of the Ministry of Power.

Twenty guineas were voted to the Institution Benevolent Fund. Announcing this, the Chairman said he had heard the question: 'Why is it necessary for this fund to exist in the Welfare State?' It was the wish of the majority of members, said Mr. Wardell, that in cases of need the Institution should be able to make donations to provide the difference between enjoying life and simply existing.

Generosity

Mr. Dyde, bringing the good wishes of Dr. Burns, President of the Institution, who is in America studying the problems connected with transportation of liquid methane, thanked the section for its generous donation.

When Mr. Wardell had read his Chairman's Address (see the next page), Mr. F. A. Rhead proposed a vote of thanks in place of Mr. Bernard Clarke, who had been called away that morning. Mr. W. Morland Fox seconded the proposal.

Mr. D. B. Parkinson, Chairman-elect, in accordance with past practice, was appointed district member of the Council of the Institution.

Members were asked to stand in honour of the memory of Colonel John Kennington.

Before Mr. R. Hutchinson, Leicester and Northants Division, E.M.G.B., read his paper 'Application of Electricity to the Gas Industry,' on the second day, a telegram to the meeting was read: It came from Mr. R. Glover: 'Much regret my medically enforced absence today. My best wishes for a happy meeting.'

Mr. Hutchinson's paper and the discussion will be dealt with in a subsequent issue of the 'JOURNAL.'

Mr. Dyde said that during the war and shortly afterwards a committee was set up by the I.G.E. to deal with the new Associate membership.

'We had to produce a proper syllabus that we felt would be useful to the gas engineer of the future,' he said. 'It is not intended that the gas engineer should be able to design systems such as Mr. Hutchinson has suggested, but he must be able to understand and operate such systems.'

The Chairman then installed Mr. Parkinson as his successor.

The social side of the two-day meeting was as eventful as ever. Members and their ladies danced at the Embassy Ballroom after Councillor Edwards had received them. During the evening prizes were awarded for the bowls and golf competitions.

Golf and Bowls

Winner of the **golf** Turner Trophy was Mr. J. S. Marshall, and of the George Wright Cup, Mr. J. Simpson.

Bowls: The Fred. Wilson Cup was won by Mr. W. D. Wilson, the Derrick Wilson Cup by Mr. L. C. B. Williams.

The mannequin parade organised and presented by Mrs. Doris Butler of Skegness was an innovation which proved most enjoyable to the large attendance of ladies. On view were spring and summer models in silk, cotton, Taiho, linen, and fine wools together with suits, gowns, and seperates from the leading fashion houses.

A vote of thanks, gracefully proposed by Mrs. R. C. Wardell, was cordially received, and the box of chocolates presented to Mrs. Butler on behalf of those who attended, conveyed in tangible form the appreciation of all concerned.

EASTERN SECTION Luncheon

Mr. Dyde Speaks of the Section's Achievements

SPEAKING at the luncheon held at the Imperial Café, Skegness, during the Eastern Section meeting, Mr. J. H. Dyde, Deputy Chairman of the Eastern Gas Board, commented on how a section moulded its form and character from the district it served.

Mr. Dyde, who was proposing the toast of the Section, said: 'The eastern counties, by any standards, are unspectacular but they have within them a culture and to the lover of nature something which you don't find anywhere else, but it is hidden and takes some seeking out.

'I feel that the Eastern Section is very much like that. You've got to seek out the achievements. It has no spectacular works in its area, no huge areas of population, and yet its achievements are there if you only seek them out.'

Mr. Dyde said the Eastern Section sprang from the Eastern Counties Association of Gas Engineers and Managers. 'While I have followed the proceedings of the Section for the past seven years I am afraid I know very little of your deliberations in the past except that at least two Presidents of the Institution, Mr. John Terrace and Sir Harold Smith, came from your ranks.'

Many others had reached prominence and distinction and gained honours and

awards. Each succeeding chairman had gained the esteem of his colleagues. 'I recall,' went on Mr. Dyde, 'that Mr. W. A. Evetts, during my year of office as President of the Institution, received the Institution Gold Medal for a paper he gave at that time. Mr. Parkinson, whose wit has seemed to blush on the desert air for so long won the H. E. Jones Medal as long ago as 1935. Mr. Bernard Clarke has been twice honoured by you as Chairman, first of the former and now of your Association.'

Each chairman, he added, implanted upon the organisation his own personality and his own originality of thought 'This has been well and ably done by so many in the past, it has indeed been done well by Mr. Wardell, ably supported by his wife, and I would like to congratulate him on a very fine year of office.'

Mr. Wardell, replying, said: 'Just over a week ago we had the pleasure of visiting one of the works with which Mr. Dyde is concerned and at which his superior was replying to a toast. He said that the big man was always generous. The greater the man the greater the generosity.

'You have been most generous Mr. Dyde, in your remarks to the Eastern Section and myself.'

The Bishop of Lincoln, continued Mr. Wardell, had recently developed citizenship as his theme for a service. He had pointed out that the individual was not made to be alone. He was made to be something only by belonging and it was by belonging that we were able to discover the meaning and fullness of life.

'We in the Eastern Section belong to the Institution of Gas Engineers and are very proud of its past career and the position it holds in the scientific and industrial world. We all work to further the aims and objects of our industry and Institution and I think I can say we are good citizens in industry.'

Mr. D. B. Parkinson, Senior Vice-Chairman, Eastern Section, proposing the toast of the guests, welcomed Councillor J. H. Edwards, the Chairman, and two other members of the Skegness U.D.C., the Town Clerk and the Entertainments Director. They were also pleased to have with them Mr. Prior, of the Gas Division, and Mr. Jenkins, Regional Fuel Director, Nottingham.

Mr. Dyde was welcomed as a representative of the President of the Institution; as a Past-President; and as Deputy Chairman of the Eastern Gas Board; and, added Mr. Parkinson humorously, as a member of the International Gas Union.

There to represent the Secretary of the Institution was Mr. Higgins, the Assistant Secretary. Mr. Parkinson referred to a recent 'GAS JOURNAL' allusion to Dr. Braunholtz and Mr. Higgins: 'Not perhaps the power behind the throne, but certainly part of the secret behind the success.'

Mr. F. L. Atkin, Chairman of the Midland Section, was also welcomed.

Mr. Parkinson greeted the Press, mentioning Mr. Clifford King, Managing Director of the 'GAS JOURNAL.'

Also mentioned were Mr. A. Gwynne Davies, Secretary of the East Midlands Gas Board, Mr. C. A. Brain, Accountant, Lincolnshire Division, and Mr. F. G. Pyper, Chief Engineer of the East Midlands Gas Board, who had been a pupil together with Mr. Parkinson in the Gas Light and Coke Company.

After a welcome had been extended to the ladies, Mr. R. S. Johnson, Chairman of the East Midlands Gas Board was greeted, and he responded to the toast.

Mr. Johnson said he was obliged for all that had been said, and pointed out that Mr. Parkinson himself was the bearer of a well-known and highly respected name in the gas industry.

He believed two thirds of the Eastern Section's members served the Eastern Gas Board; the other third serving the East Midlands Board. As part of a minority, therefore, it behoved him to speak with proper humility, but in this free country, the rights of the minorities were always observed.

'What does matter,' said Mr. Johnson, 'is your friendliness and your kindness, and probably I am in a better position to see it because I am a newcomer.'

Mr. Bernard Clarke, General Manager, Lincolnshire Division, East Midlands Gas Board, proposing the toast of the Urban District Council of Skegness, said: 'This section of the Institution only a few years ago accepted the hospitality of the Skegness U.D.C., and I think this return visit is a measure of the welcome we had.'

He congratulated the Council on the very great amenities it had made out of natural resources and commented on the good relationship which had always existed between the local authority and the public utility.

Councillor Edwards responded.

EASTERN SECTION Chairman's Address

The Boston Undertaking

By R. C. Wardell,

GROUP MANAGER, EAST MIDLANDS GAS BOARD.

THIS will be the third occasion on which the Boston undertaking has been the subject of a president's or chairman's address. The last was when my predecessor Mr. W. C. Chapman was your President in 1938, while prior to that Mr. J. S. Dougall occupied the office in 1905.

Boston is an agricultural town of some 25,000 inhabitants and has had a gas undertaking since 1825 when an Act for lighting with gas the Borough and neighbourhood received the Royal assent. The gas load, as might be expected, is practically all domestic and is dependent upon the prosperity of agriculture and the number of new houses built.

Sales Jump

From 1926 to 1941 the annual sales of gas increased from 640,000 therms to 870,000 therms, equal to an average annual increase of 15,000 therms, while from 1941 to 1944 the yearly increase had jumped up to 61,000 therms with a total annual sale of 1,054,000 therms. By 1944 it was apparent that with the rising output of gas the horizontal plant would be severely taxed by 1950 and that steps should be taken to safeguard the position.

The old horizontal plant, the main portion of which had been built in 1922, consisted of five beds of eight retorts 22 in. by 16 in. by 20 ft. through, in three tiers and four beds of six retorts 24 in. by 16 in. by 20 ft. through in three tiers, fed by a Drakes charging and discharging machine. There was no mechanical means of handling the hot coke once it was discharged from the retorts. The coke had to be quenched and removed in barrows which were tipped in the yard. This work was extremely arduous, and as the demand for gas grew it became increasingly difficult to get men physically capable and willing to handle barrows containing 4-4½ cwt. of red hot coke.

The works, occupying 6.9 acres, is situated in a residential area with houses within 150 ft. of any carbonising unit and many complaints had been received from the public regarding the smoke and dust nuisance from the horizontal retorts, so that any new carbonising plant had to eliminate smoke and dust. Again ground space was most important owing to the fact that in order to give suitable rail facilities we only had two small sites available. It was clear that a continuous vertical retort installation was the only system for our requirements.

Postponed

The Ministry of Fuel and Power was approached in February, 1945, with a view to getting its approval of a new carbonising plant, but although our case was accepted we were asked to postpone the scheme for six months. After further

approaches had been made the Ministry eventually gave us authority in September, 1948, to accept a tender from the Woodall-Duckham Company for an installation of twelve 82-in. Lambent heated continuous vertical retorts complete with coal and coke handling plant, in a house designed to take 16 retorts. The initial daily output of the plant is 1½ mill. cu.ft. at 500 B.Th.U. This can be increased to 2 mill. by the addition of the further four retorts.

The site of the new plant was examined by Ground Explorations, Ltd., in July, 1951. Four 6-in. diameter bore holes were sunk to a depth of 65 ft. and showed that over the whole area there was 20 to 25 ft. of silty sand lying upon firm chalky boulder clay. The clay was proved in each case to 65 ft. below the surface. Observations of the ground water level over a period showed little variation from 4 ft. below the surface. These conditions were what had been expected and had been allowed for in our original enquiry. What had not been anticipated was that the water analysis suggested that it would be prudent to use sulphate resisting cement in the foundations.

In April, 1952, piling for the foundations was begun. This work involved driving 123 17-in. diameter Vibro piles to a depth of 47 ft. and took just over five weeks. As a point of interest I would mention that in 1932, 213 similar piles were put in for a gasholder some 200 ft. from the site of the new retort house. These piles were distributed over a circular area 107 ft. in diameter and varied in length from 34 to 36 ft. Two piles out of the 123 were selected for load testing. The test load applied was 82.5 tons, resulting in maximum deflections of 0.137-in. and 0.121-in. and permanent sets of .055 in. and .023 in. The application and removal of the test load occupied 58 hours.

Erection of the plant went according to plan and enabled gas-making to begin on April 28, 1954.

W.-D. Design

The carbonising plant is the latest Woodall-Duckham design of Lambent heated retorts incorporating air cooled floor joists and 1 ft. 11 in. transverse walls which can be air cooled if required. The whole setting is heated by three external step grate producers suitable for using a mixture of coke and 10% breeze.

Coal is brought in by railway wagons which are emptied by a side tipping wagon tipper designed to handle 24½-ton wagons with a gross weight of some 32 tons. The coal is discharged into a 25-ton receiving hopper from which it is withdrawn at a rate of 45 tons per hour by means of a vibrating feeder on to a push plate conveyor. The push plate conveyor feeds either direct or via a single roll coal breaker, a lip bucket conveyor serving the overhead hoppers which have a capacity equivalent to 48 hours' supply. The receiving hopper has hinged steel doors in one side so that should the tipper fail coal can still be fed to the plant by means of road vehicles.

A second lip bucket conveyor could easily be installed at a later date.

The coke plant has a capacity of 25 tons per hour, and the screens which are of the reciprocating conveyor type are located over blue brick lined storage hoppers having a total capacity of 250 tons.

In the coke screening house an attempt has been made to reduce the amount of exposed steelwork to a minimum, by providing concrete floors and by encasing as many steel members as possible in concrete, the object being to reduce maintenance costs.

The steam for the whole works is generated in a 7,000 lb. per hour waste heat boiler at a pressure of 120 lb. per sq. in. The lay-out of the plant is such that a second waste boiler can be installed when required. The exhaust from the boiler fan turbine, extractor engines, boiler feed and liquor pumps, is fed into a low pressure main fitted with a relief valve to blow off at 25 lb. per sq. in. The steam required for retorts, producers, boiler feed water heating, hot water supply to the messroom and heating of the messroom is taken from this main. The discharge from all steam traps working on the high pressure steam line is collected and led back into the boiler water feed tank. The only steam condensate lost on the plant is that discharged from traps working on the low pressure line. This discharge is contaminated with oil and has to be passed to the drain via oil separators.

Efficiency

The electricity supply is taken from the East Midlands Electricity Board who feed at 3.3 kVA into a small sub-station on our property and give us a 415 volt 3 phase 50 cycle supply. We decided to abandon our old D.C. supply and go in for A.C. equipment on the new plant as we were able to make an initial saving of £1,200 in addition to lower maintenance costs. The whole system has power factor correction equipment fitted in the form of two 20 kVA capacitors. It was calculated that the capacitors which cost £288 to install would pay for themselves in just over two years and this result has in fact been achieved. The efficiency of the capacitors may be judged by the fact that since the plant went to work we have carried a leading power factor of .989. The electricity charges are based on a maximum demand charge of £10 per kVA and 0.79d. per unit plus a coal clause resulting in a charge of 1.25d. to 1.31d. per unit depending on the time of the year. Since the completion of the plant an earth leakage indicating and alarm system has been fitted to our main switchboard.

Power points for small portable tools are placed at strategic positions throughout the plant and are supplied through a transformer to give a 110 volt supply. There is also a 415 volt 3 phase 60 amp plug point fitted with earth leakage trip equipment which allows a 330 amp portable welding set to be used when required.

With the object of eliminating dust as much as possible a dust extraction plant was provided to work in conjunction with the travelling coke chute under the retorts. A vacuum cleaning plant was also installed. The whole retort house is lit by a combination of fluorescent tubes and filament bulbs.

Although Boston is supplied by two separate feeders from the electricity grid it was without a supply of power for nearly three hours during the severe winter last year, and although gas-making did not cease the position very nearly arose. As a result of this experience a 37.5 kVA revolving armature alternator driven by a 48 B.H.P. diesel was placed on order and is now in the process of being installed. The alternator and the grid supply both feed through triple pole and neutral interlocked switches, the common busbar chamber of our main distribution board. The object of the switches being interlocked is to avoid the possibility of a connection being made between our alternator and the grid supply.

Water Tube Condenser

From the retort house the crude gas passes along some 300 feet of 18-in. diameter stress relieved welded steel main to a new 1 mill. cu.ft. per day high velocity vertical water tube condenser, which can be worked in parallel or series with our old 1 mill. vertical water tube condenser, or independently. The hot circulating water from the new condenser passes into an overhead balancing tank from which the lime-soda water softener which supplies the waste heat boiler is fed. Any surplus hot circulating water is cooled down by passing through two cooling towers, each of which is provided with an electric fan at the top to promote, if necessary, increased air circulation through the tower. The cooled water is re-circulated through the condenser, while fresh make up water, sufficient to meet the needs of the waste heat boiler and evaporation losses in the cooling towers, is introduced into the circuit through a ball valve in the cold well at the base of the second cooling tower. With this system we are able to return to the retort house via the boiler feed water some of the heat in the crude gas and at the same time prevent any undesirable increase in the quantity of dissolved solids in the circulating water.

After the exhausters the gas passes through a 2 mill. cu.ft. per day plate type detarrer than through a new length of overhead 18 in. diameter stress relieved welded steel main incorporating valves and branches which will allow a second detarrer to be installed easily when required and also provides the connection for a 2 mill. cu.ft. per day static ammonia washer.

The electro-detarrer and the ammonia washer are erected on the site of two cast iron tower scrubbers 10 ft. diameter and 65 ft. high. The dismantling of the scrubbers presented a problem as owing to the 18-in. diameter gas main running round the base being still in use it was not possible to allow any of the cast iron plates to fall to the ground. The towers had to be lowered to the ground in sections; this was achieved by using a mobile crane with an 80-ft. jib which picked up two circular sections weighing five tons and lowered them to the ground where they were broken up.

EASTERN JUNIORS' ANNUAL GENERAL MEETING HEARS TALK ON

The Pattern of Integration in the Area

THE annual general meeting of the Eastern Junior Gas Association was held on May 25 at Clacton-on-Sea, with Mr. E. S. Dennis, President, in the chair.

Included among the guests were Mr. J. H. Dyde, Deputy Chairman, Eastern Gas Board; Mr. R. H. Epps, Secretary, Eastern Gas Board; Mr. D. B. Parkinson, Area Liaison Engineer, Eastern Gas Board; Mr. B. Clarke, Divisional General Manager, East Midlands Gas Board, Lincoln; Mr. R. Whiting, Divisional General Manager, Eastern Gas Board, Ipswich; and Mr. R. C. Wardell, Chairman, Eastern Section, Institution of Gas Engineers.

Officers and Council elected for the year 1957-58 were: President, Mr. J. L. Ireland; Senior Vice-President, Mr. W. F. Pritchard; Junior Vice-President, Mr. W. J. Spiller; Honorary Secretary and Treasurer, Mr. V. A. Bignall; Assistant Honorary Secretary, Mr. E. S. Williams; Members of Council, Mr. H. J. Blakeley and Mr. R. E. P. Hoskin.

Rise in Membership

In his report, the President commented on the continued steady rise in membership, which had been a feature of the past years, and on the fact that despite travelling difficulties during petrol rationing attendances at meetings had been well maintained.

Mr. Dennis thanked the Eastern and East Midlands Gas Boards on behalf of the Association for their hospitality, facilities made available, and their readiness to allow members of their staffs to attend meetings.

In conclusion, he thanked Members and the Council for their support during the session.

Mr. R. W. Hilham, Colchester, proposed a vote of thanks to the Eastern and East Midlands Gas Boards to which Mr. B. Clarke, Divisional General Manager, East Midlands Board, replied on behalf of both Boards, which, he said, would continue to support the Association.

Following the meeting Members and their ladies were entertained to luncheon by the Eastern Gas Board. The toast to the Eastern Juniors was proposed by Mr. R. Whiting, Divisional General Manager, Ipswich, and the President replied. The toast to the Eastern Gas Board was proposed by the Senior Vice-President, and President-Elect, Mr. J. L. Ireland, and Mr. J. H. Dyde, Deputy Chairman, Eastern Gas Board, replied.

The meeting concluded with a tea dance at the Beaumont Hall Hotel at which Members and visitors were guests of the Association.

The main address to the meeting, entitled, 'The Pattern of Integration in the Eastern Area,' was given by Mr. D. B. Parkinson, M.B.E., Area Liaison Engineer to the Eastern Gas Board.

After remarking on the disappearance of the engineer and manager of the small undertaking, who had had to be something of a jack-of-all trades and whose work, with the coming of integration, was being divided among specialists, Mr. Parkinson said it was the losses of the very small works, of which East Anglia had so many, which had made it necessary to press on with integration.

'The difficulty in this part of the country was—and is—the distances involved,' continued Mr. Parkinson. 'There were very few large works from which supplies could be taken.

'After the war plans were in hand for making Braintree the centre of a small integration scheme which would have included Witham, Maldon and Earls Colne and plant to the value of approximately £139,000 was actually on order. Braintree might be said to be the beginning of the Eastern Gas Board's rural integration. With the advent of nationalisation and the formation of the Eastern Gas Board, both Colchester and Chelmsford came under the same control as Braintree and it was manifestly uneconomic and unnecessary to build up a manufacturing station at Braintree when gas could be obtained from these other works at both of which new carbonising plant was in course of construction or had recently been put to work. There had in point of fact, been some negotiations with Chelmsford about a possible supply, but these had fallen through. Colchester had the advantage of being a works which received its coal by sea and as the plant there was the further advanced and there was sufficient gas available for the immediate loads, it was decided to take gas from that works.

Larger Scheme Envisaged

'As it was not envisaged that the pressure on the proposed trunk mains system would exceed 25 lb. per sq. in., it was decided to use cast iron pipes and although there was a shortage at the time, the Clay Cross Company were able to supply them within the time required and mainlaying actually started in February, 1950. While the immediate need was to give gas to Braintree, a much larger scheme, giving a bulk supply to Kelvedon, Witham, Maldon and Earls Colne was envisaged with a main linking eventually right through to the other manufacturing station at Chelmsford and this came to be known as the Essex Integration Scheme. The main to Braintree did not therefore go by the direct route from Colchester but through Kelvedon, to Witham with 14-in. and 12-in. main and a 10-in. branch from Witham to Braintree. A gasholder of 200,000 cu.ft. capacity, the order for which had been placed by the British Gas Light Company, was constructed on a new site which was to be the industrial part of Witham and when the works was closed it became the distributing centre.

'As the A12 road from Chelmsford to Colchester is a very busy one and much of it is a Roman road it is very expensive to excavate and reinstate. It was therefore arranged that wherever possible the main should be laid in fields behind the road and this involved negotiating 48 wayleaves and gave a very substantial financial saving particularly on reinstatement. It also greatly increased the speed at which the main was laid. Gas was first fed to Braintree on November 27, 1950, and thus your President's works became the first feeder station of the new grid.

'Work started soon after on the second section of the main to Chelmsford with 10-in pipe and here again the main was kept clear of the roadway, a further 90 agreements being made with owners and tenants en route. Later on in 1952 a main was laid from Witham to Maldon and this ran most of the way along the branch railway line. Earls Colne was given a bulk supply in 1954 by a main from the holder station at Halstead. The pumping plant for the system consists of Connersville boosters at Colchester which were transferred from Ipswich and vertical reciprocating compressors at Chelmsford.

'In 1953 another system which came to be known as the Suffolk integration system was started and this involved the conversion of eight miles of 12-in. main from Ipswich to Woodbridge into high pressure and the laying of 19 miles of 8-in. main from Ipswich to Wickham Market, Saxmundham and Leiston.

'In 1955/6 the Essex and Suffolk systems were joined together by the laying of 14 miles of 14-in. main from Colchester to Ipswich and the last joint was made at East Bergholt in July last year by Mr. David Renton, then Parliamentary Secretary to the Ministry of Fuel & Power.

69-mile Main

'Branches were taken to Hadleigh and Manningtree to close down those works and a final link is being made at the present time for Maldon to Southminster which as far back as 1954 had received a bulk supply from Burnham. This will be used in the reverse direction and Burnham itself will be closed down. There is, therefore, now a continuous main of approximately 69 miles in length from Chelmsford right through to Aldeburgh.

'The system is balanced with three manufacturing stations which are able to give mutual assistance and this is of particular value at times of resetting or other repairs, or in the event of breakdown. Gas manufactured at Ipswich, where the coal is seaborne, is among the cheapest in the Area. Altogether 95 miles of integration mains have been laid since vesting date in the Ipswich

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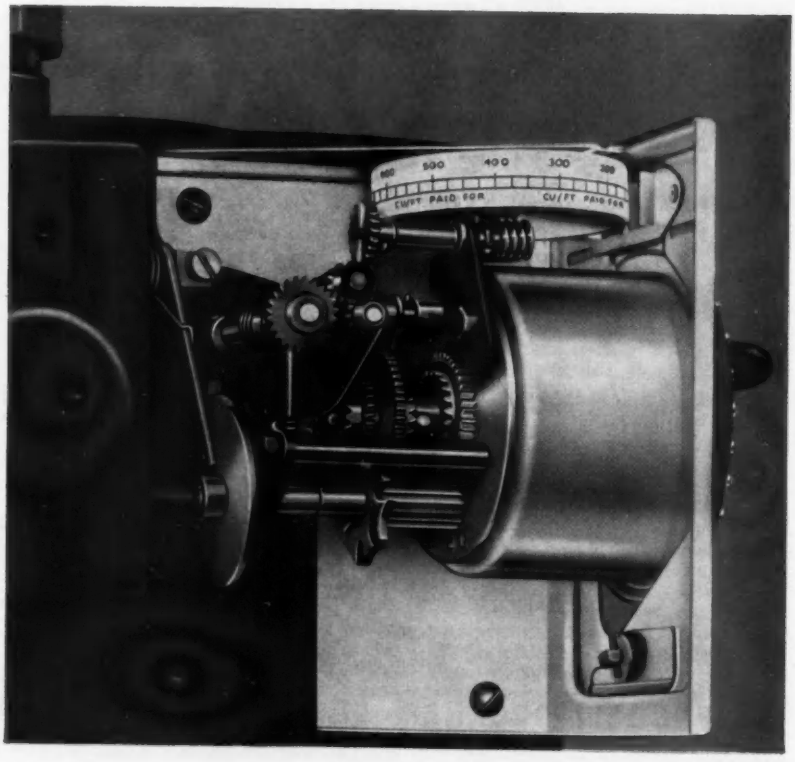

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Division and the total number of wayleave agreements entered into was 283. The final saving achieved from the system by the closing down of 10 works and a reduction in cost of manufacture at the three production stations is estimated at £84,000 per annum. There have been large increases at the undertakings closed down which could not possibly have been met by the plant there.

'In the Tottenham and Watford Divisions which might be termed the metropolitan divisions, the larger works had already been inter-connected through mains laid before Vesting Day by the former Tottenham and Watford and St. Albans Companies. The Watford Division which includes much of the area formerly belonging to the Tottenham Company has a special problem with four new towns within its boundaries. It was quicker after vesting day to put into action its existing plans and to extend them to provide additional links to those places which were already holder stations, such as Stevenage, Welwyn Garden City and Hatfield in order to bring gas from St. Albans and Watford to meet the vastly increased demands there. Also a main was laid from Dunstable to Luton to give much needed assistance to that works. Connections have been made to the system to close down Woburn, Woburn Sands, Markyate and Baldock. The St. Albans and Watford works are being extended to meet the increased demands.

'In the Tottenham Division new plant at Willoughby Lane works and recently the installation of a Segas oil gasification plant of 3.7 mill. cu.ft. capacity at Ponders End provides for the needs of the new town of Harlow to which a trunk main has been laid and for bulk supplies to Epping, Thaxted and Dunmow. The latter is a case of inter-Divisional assistance as Dunmow was in the Ipswich Division. It has now, however, been taken into the Tottenham Division. A second unit of Segas plant at Ponders End will permit of the closing down of Hartford next year, a linkage having already been made to that works.

Cambridge Division

'In the Cambridge Division work started in 1953 on an extensive divisional integration scheme which will eventually concentrate manufacture in three major works only—Cambridge, Bedford and Peterborough, with control of the system centred at Cambridge. The mains are all being laid in welded steel, and there will be a "spine" main running from Peterborough to Girtford near Sandy. This main, which is of 12 in. diameter, is being tested to 450 lb. per sq. in.—the highest pressure so far used in this country—in order to make it suitable for the transmission of gas from coke oven plants, complete gasification plans or even natural gas in the Midlands should any of these gases become available in the future.

'So far the section of this main from Peterborough to Whittlesey has been completed, together with another section running up from the south at Girtford to St. Neots and Huntingdon. From the northern part of this spine a 6-in. main has been laid to March, Wisbech, and Chatteris, closing down Chatteris and retaining Wisbech and March as base load stations.

'These mains, like those in the Ipswich Division, have been laid as far as possible away from the roads in open country, making use of wayleaves, and very good progress has been made, full use having been made of mechanical aids to laying. Strict control and inspection of all welding is being undertaken by a firm specialising in this class of work, and cathodic protection is being applied throughout. There are temporary control centres at present at Peterborough and Bedford, using instruments which record the volume of gas passing into the holder stations and the stock in the holder. A control centre is, however, being built at Cambridge works which will cover the whole system and will be technically of considerable interest. I do not, however, propose to say much of the integration in this Division, as I am hoping that it may be the subject of a special Paper later on. Mr. E. H. Winch, the Cambridge Divisional Engineer, who was the first President of your Association is in charge of this work.

'Mains are at present being laid from Cambridge to Newmarket and Soham, with a branch to Mildenhall, Ely and Littleport and another branch from Cambridge to St. Ives and Huntingdon.

Load Doubled

'A bulk supply to Royston had been part of the Division's long term plan, and those who are concerned with industrial gas will be interested to know that an application for a supply of gas from a commercial firm showed that the local load would be practically doubled which would have involved considerable extensions at the works to meet it. It was decided therefore to accelerate this part of the programme and lay the main from Cambridge, only taking into account the difference in cost between a 4-in. main as originally proposed and a 6-in. required in view of the new load, when computing the charge for gas to the factory. The main is now laid and Royston is shut down.

'The possibility of London overspill taking place at Haverhill, greatly extending the population of that town, will mean that the manufacturing plant will be entirely inadequate to deal with it, and plans are being considered for a branch from the Cambridge-Newmarket main to Haverhill to give it a bulk supply. This is another case of inter-divisional assistance.

'The Norwich Division has not, for reasons largely connected with the future of Norwich works itself, been able to proceed as rapidly with integration as the other Divisions, but this has now started and the mains from Norwich have been extended beyond Aylsham to Cromer which has already been connected to Sheringham and Holt, in order to close down Holt and assist Sheringham which has been continuing to manufacture. Another branch is being taken to Mundesley and North Walsham and all those works are to be closed down and supplied from Norwich. This cannot be done, however, until compressing plant is delivered at Norwich.

'The Division has, however, the distinction of having the first small diameter main integration system actually to be laid in the country although in fairness it should be mentioned that the Northern Board had planned one even earlier. This is from East Dereham which has an output of 48 mill. cu.ft. per annum to Watton (8.6 mill. cu.ft.) and Swaffham (20.7 mill. cu.ft. per annum).

Extension Required

'The cost of gas manufacture at East Dereham where there is a continuous vertical carbonising plant was in 1953-54, 14.27d. per therm compared with 23.87d. at Swaffham and 20.83d. at Watton. East Dereham had reached a point at which extensions to the manufacturing and ancillary plant were required and a new gasholder was on order. At Swaffham an expenditure of £11,000 and at Watton £16,450 would have been required if manufacture were to be continued. This appeared, therefore, to be a case for a small self-contained integration system. Consideration of the costs of supplying gas in bulk from East Dereham showed that the interest and depreciation charges on the main would bear a very large share of the total cost and the volumes to be handled and were so small that the horse power requirements and capital charges on the compressors could not vary widely whatever the size of the main. It was, therefore, decided to use small diameter pipe of 2½-in. and 2-in. diameter allowing for pressures of up to 50 lb. per sq. in. The 2½-in. main was used for the first 9½ miles which carried the load for both Swaffham and Watton and it was reduced to 2 in. for the 3½-mile leg to Watton and the 6½-mile leg to Swaffham.

'Finally, another self-contained system is under way in the Southern part of the Norwich Division. Lowestoft and Gorleston were linked together in 1954 to permit Gorleston to help Lowestoft. Oil gasification plant (Segas) has been ordered for Lowestoft and the two works together will supply gas in bulk to Beccles, Southwold, Loddon, Bungay, Halesworth, Harleston and Diss.

'I have tried to give you some sort of picture of the build-up of integration in the Eastern Area. To date 28 works have been closed down out of the 92 manufacturing stations which the Board had at vesting day. There are still more to close. The concentration of manufacture into larger units and the opportunity of operating more works as base-load stations will help to keep down the cost of gas into the holder in the face of rising prices. Gas producing plant operating with new techniques, such as catalytic oil gasification and complete gasification, is already being introduced at many of the works and the Board is constantly on the watch for other new projects which will help to keep gas competitive in price and service in these atomic days.'

Mr. B. Wilkinson, Divisional Engineer, Ipswich, thanked Mr. Parkinson.

Steps which the Scottish Gas Board are taking to further their far-reaching integrated grid system are reviewed by our TECHNICAL EDITOR.

Pictured, left, is the exterior of the new retort house and coke handling plant at Dumfries, showing its attractively designed facade.

NEW PLANT IN SCOTLAND

THE planning of a production and integration programme for Scotland is a formidable task by virtue of the fact that manufacture and distribution of gas have always been confined to a number of isolated areas, while the comparatively localised industrial regions do not permit the degree of linkage attainable in England.

There is, indeed, an industrial belt extending eastwards from Glasgow through Lanarkshire towards Edinburgh and north eastwards up to Stirling, and another area of minor industrial interest in Fife and north east to Dundee. But, except for the area of heavy industry on the Clyde, the engineering works near Dumbarton, and the factories round Paisley, the industrial areas are, perhaps, of less importance to the gas industry than they are in England. For this reason the large manufacturing units being built throughout most of the English area boards are not found to the same extent in Scotland. The Granton works in Edinburgh is an exception, being the largest in Scotland. Elsewhere in Scotland it has been necessary to maintain supply by local linkages between undertakings where this was economically possible or else to try to bring the small isolated local gasworks up to date.

The supply of gas to remote parts of the Board's area—which includes the outer Hebrides, Orkney, and Shetland—is one of considerable difficulty, both administratively and economically; and because of their remoteness undertakings in such areas will see little change except that they must be administered from a divisional centre. However, undertakings of intermediate size, which are too far away from centres of population to become part of a grid system, are of special interest. Among such undertakings, two have carbonising plants which have been completely modernised within the last few years and provide examples of what can be done under such conditions. The Scottish Gas Board is extending its larger undertakings, too, and they will eventually become part of an integrated grid system or, in the more isolated districts, part of a local link-up system.

Examples of works where the carbonising plant has been completely rebuilt and has replaced previous plant are Dumfries and Peterhead. At Dumfries—inaugurated by Provost G. J. McDowall on Friday last—a West's continuous vertical plant with a capacity of 1.2 mill. cu.ft. per day has been installed, complete with coke screening plant. At Peterhead, in Aberdeenshire, a West's continuous vertical plant was installed in 1951 with a capacity of 600,000 cu.ft. per day, with provision for an extension to 800,000 cu.ft. per day.

Considerable additions have been made to the plant at Kilmarnock, which is on the edge of the Glasgow industrial area and is rapidly developing an industrial load. Here, too, a West's continuous vertical plant has been installed, with a total capacity of 4.5 mill. cu.ft. per day. The plant at Provan on the outskirts of Glasgow is being considerably extended. It will consist of 24 82-in. Woodall-Duckham continuous vertical retorts complete with the most up-to-date methods of waste heat recovery and two new carburetted water gas plants by Humphreys and Glasgow Ltd. The original plant was a very large example of Woodall-Duckham design built in 1921 and consisting of 192 retorts in one retort house—the largest number of retorts under one roof in the United Kingdom when built. Another works to be extended is that at Aberdeen where an extension of 16 103-in. retorts is being added. This is the fifth Woodall-Duckham retort installation to be built at Aberdeen. It is contained in a completely new retort house and provided with up to date means of heat recovery and modern amenities for the men.

Gas-making began at Dumfries in 1820 when a group of local businessmen got together to form a company with a capital of £8,000 to manufacture and distribute gas. This company proved to be a very flourishing concern so that from time to time both the carbonising plant and ancillary plant had to be enlarged until, in 1878, the Dumfries Town Council, which saw how greatly the town was benefiting from it, decided to purchase the undertaking for £21,000.

From then on, the demand for gas

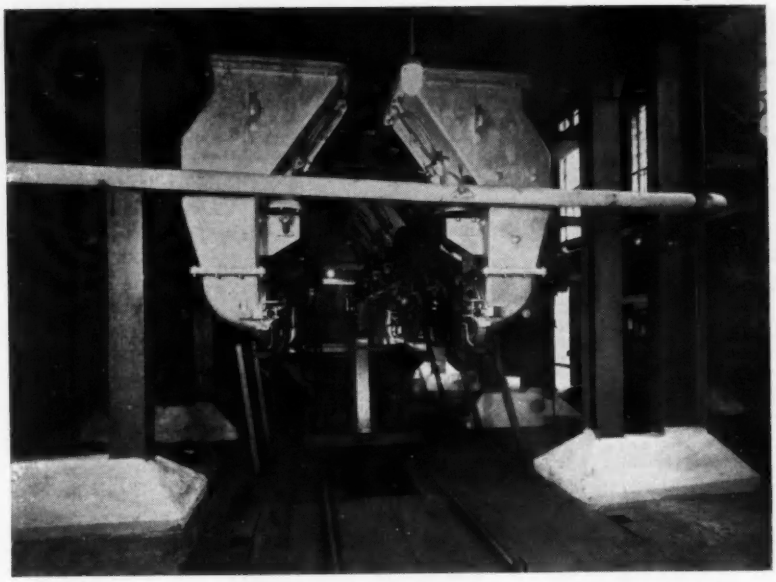
slowly but steadily increased, making it necessary to install more plant. When the Council first took it over a good deal of modernisation had been necessary and it was not long before extra storage capacity had to be considered. A .5 mill. cu.ft. capacity holder was erected in 1910, followed by a new retort house with fully mechanised benches of horizontal retorts. Three new purifiers, with provision for a fourth, were laid down in 1914—the fourth being added in 1953—to deal with a daily output of .75 mill. cu.ft. In 1928, the question of storage capacity again became acute, necessitating the addition of a spirally guided holder of .75 mill. cu.ft.

During the last war, greater demands than ever were made on the plant both by housing estates built just before the outbreak of war and by the need for benzole extraction at the works. At the same time coal quality was of the worst. It was decided to install a Tully total gasification plant, which was completed and put into operation in February, 1945. This was a temporary expedient and by 1950 the horizontal plant seemed to be reaching the end of its economic life; to tide over production difficulties once more, it was decided to install a C.W.G. plant while long-term plans for a complete renewal of the carbonising plant were being considered. In 1954, a Balfour C.W.G. plant of .75 mill. cu.ft. a day commenced production.

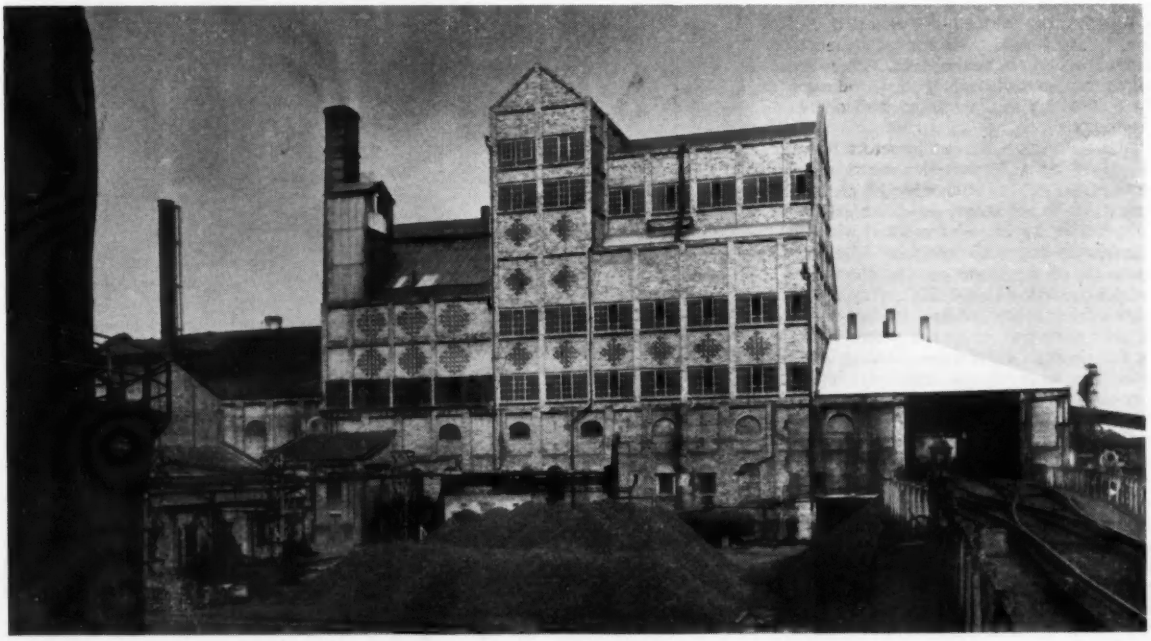
Today both the Tully and the old horizontal plant have been superseded by modern continuous vertical retorts.

The new carbonising plant which has been built by West's Gas Improvement Co. Ltd., of Miles Platting, Manchester, is contained in a modern brick retort house of pleasant design. It is completely self-contained, including coal and coke handling plant, all of which is of West's design and construction, except the wagon tippler which is by Strahan and Henshaw. The plant has a capacity of 1.2 mill. cu.ft. per day with space for future extensions; it consists of twelve 50-in. retorts in three settings of four retorts built back to back. The coal is brought in from the British Railways main line by a private siding 300 yards long to the coal tippler which can handle wagons of up to 24 tons capacity at a normal rate of 50 tons per hour, but can deal with a maximum of 65 to 70 tons of coal per hour.

From here the coal passes through a single roll coal crusher to a 30-in. belt conveyor beneath the retort house which transports it to a gravity bucket elevator which, in turn, carries it up to the retort house bunkers. These bunkers have a capacity of 48 hours when the plant is being run at full output and are fed by a belt conveyor. The gravity bucket elevator can alternatively be used for coke handling. At the base of the retorts a hand-operated coke car is provided which can be moved to any retort discharge mouthpiece and guide the coke discharged into the bucket of the elevator which runs horizontally under the retort setting. By this means coke is elevated and can be either taken direct to the screening plant which is situated in an annexe of the retort house, to a producer fuel bunker of 16 tons capacity, to a scurfing bunker holding three tons, or to a night storage hopper of 60 tons capacity which is big enough to store all



View of the coke extractor chambers and hand-operated hopper at Dumfries.



A general view of the retort house at Kilmarnock.

View of charging floor at Dumfries showing coal boxes and gas off-takes.

coke made at the week-end. The retort settings are of the standard Glover-West pattern with liquor sprayed gas off-takes, and are controlled by a Bryan Donkin gas-operated retort house governor. The extractor gear is electrically driven by an L.D.C. standard gasworks type electric motor with a steam standby.

The extractors are the Wests vertical spiral type delivering coke into a sprayed coke chamber, each capable of holding two hours' make of coke. The steaming of the retort charge is controlled by a West-Taylor valve. All auxiliary machinery in the retort house is electrically driven. This includes the liquor circulating pumps, which are of the centrifugal type, and also the retort house lift.

The producer fuel is loaded from the 16-ton bunker into a hand operated skip which is provided with a static screen to extract all breeze below $\frac{3}{16}$ in. There are three pressurised step grate producers, two of which are in service with one as a standby.

All steam for use in the retort house is raised by a Spencer-Bonecourt waste heat boiler which is capable of generating 8,000 lb. of steam per hour at 100-110 lb. per sq. in., and is fitted with an electrically-driven Sirocco fan. The temperature of the waste gases at the outlet of the boiler is about 205°C. Any excess steam from the waste heat boilers which is not made use of in the retort house is fed through a pressure reducing valve into the works steam main at 80 lb. per sq. in. There are two steam-driven G. and J. Weir boiler feed pumps with one as a standby.

The coke handling plant consists of a West's selective screening plant. This is of unusual design and consists of rake-like screens, the distance between the prongs being adjusted according to the size of coke to be passed. These screens are placed horizontally across a 40-in. band conveyor at an angle of 45°, and are given a vibrating motion by special 'Trillor' motors.

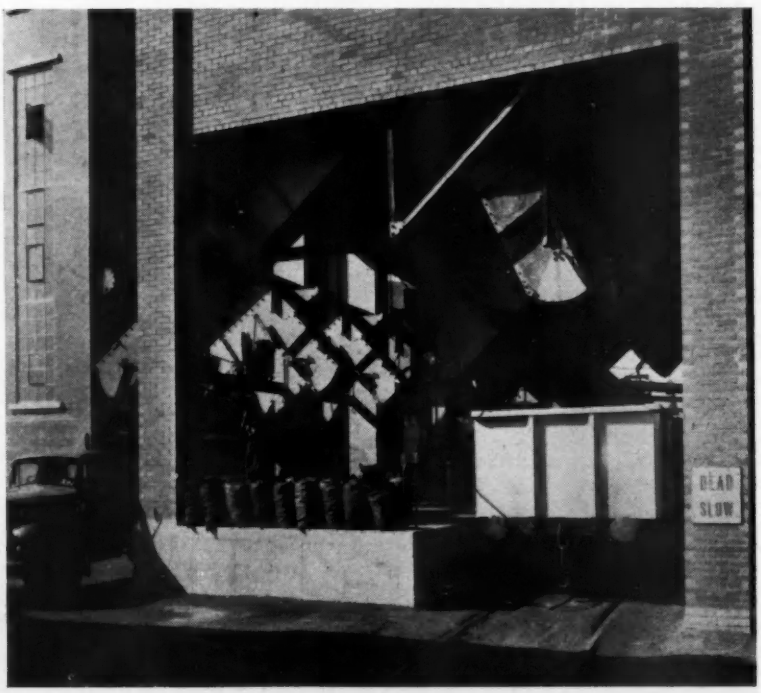
The coke travels down the length of the vibrating rake, the undersize coke passing through and the oversize coke being diverted to the side and then to the bunker below. The coke is screened into four sizes of coke and breeze—over $1\frac{1}{4}$ in., 1-2 in., $\frac{1}{2}$-$1\frac{1}{4}$ in., 0-$\frac{1}{2}$ in.

The civil engineering work which had to be carried out before the new retort house could be erected was complicated by the fact that the water table is only 9 ft. 2 in. below the surface and by the presence of the 'burn' which runs through the works. Before the retort house foundations could be laid down, it was not only necessary to drive about 100 piles, but to cantilever the foundations on the south western side to avoid the 'burn.' The high water table did not help matters when it came to constructing the cellars to house the conveyor belts from the tippler. It was necessary completely to line the below-ground part of the retort house with reinforced concrete before building could proceed.

The result is a typical medium-sized modern retort house which enhances the old gasworks site. The old buildings which contained the horizontal retort benches and Tully plant, and which still contain the Balfour C.W.G. plant, are built—and built to last for ever—of local sandstone and are typical of the construction design of 40 or 50 years ago.

Dumfries is too isolated to become part of an integrated grid system, so it was necessary to rebuild the gas-making plant in accordance with modern needs. This has been done although the old ancillary plant, installed originally in 1910, extended in 1928, and well maintained, is being retained. The siting of the new retort house enabled a connection to be made into the foul main from the old retort house, and as this ancillary plant is of a capacity equal to present day demands, no further additions have been necessary; in fact by the installation of the new waste heat boiler enough steam is being raised by one Lancashire boiler kept on slow fires only.

The plant at Peterhead is another example of an installation made within the last few years to serve an isolated district where a gradual increase in consumption may be expected. Peterhead, in Northern Aberdeenshire, has a population of about 20,000 and depends on fishing and granite quarrying for its livelihood, though it boasts of one of



Coke loading bays at Dumfries.

H.M. prisons among its sources of income. It is too isolated to be linked economically with any other neighbouring source of gas production and when the former horizontal retorts required replacement in 1946, it was decided to erect a small modern plant with the most up to date means of mechanical handling, producer gas firing, and waste heat recovery. The new plant has a gas-making capacity of 600,000 cu.ft. per day, with space for future expansion to 800,000 cu.ft. per day; like the Dumfries plant it was built by West's Gas Improvement Ltd. of Manchester. It consists of six 50/56 in. vertical retorts 25 ft. long, complete with built-in producers and mechanical handling for coal and coke. The brick retort house, is of typical post-war design, contrasting strangely with the old buildings now used for a coal store and the exhauster house. A small but adequate ancillary and purifier plant which was part of the old works, together with two holders of 112,000 and 250,000 cu.ft. capacity respectively, a workshop, and a combined office and showroom comprise the rest of a small but economically laid out site.

The new plant went into operation in 1950 and is an excellent example of what good design and layout can do when applied to a small works. Coal is brought in by road vehicle and tipped into a coal receiving hopper from which it is raised by an inclined elevator to the bottom of a West's lip bucket elevator. It is transported to the top of the retort house to fill the overhead coal bunkers or, by means of chutes, is ejected into the coal store for which the old retort house is used. The lip bucket also handles the run of retort coke and delivers it either to the main coke storage bunker, the producer fuel bunker, or the scurfing bunker, all of which are built of brick and steel, and have a combined capacity of 65 tons. The chute to these bunkers combines a fixed screen which will separate the small coke, which is passed to the producer fuel bunker, and allows the oversize to pass to the main coke department for local sales. Coke may be delivered directly into lorries or filled into sacks for small orders by a Belle Isle bagging machine.

There are two step grate producers, one of which is a standby, and each of which is capable of firing the setting. These producers are fitted with extension pipes to the air inlets so that the air may be drawn in from outside the retort house. The gas off-takes of the retorts are of the normal type while the retort house governor is a Bryan Donkin relay type with a Peebles automatic gas relief valve fitted in the foul main.

Waste heat is recovered by a Spenser-Bonecourt natural draught waste heat boiler which raises 3,000 lb. of steam per hour at 120 lb. per sq. in. and is ample for the works needs.

Working conditions in the retort house, which can be easily run by one man on shift, are excellent. Adequate instrumentation is provided so that the stoker knows at a glance what is happening, though he can always get hold of the foreman who lives nearby should an emergency arise.

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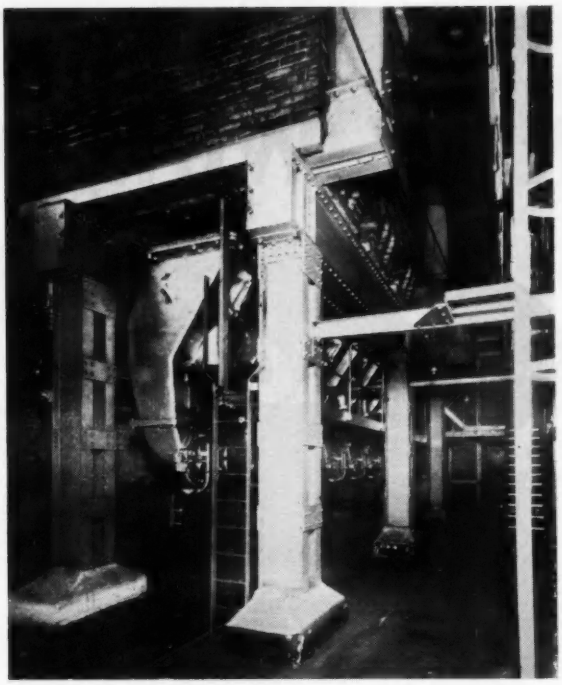

Coke extractors and bottom iron work at Peterhead.

★

The retort house at Peterhead.

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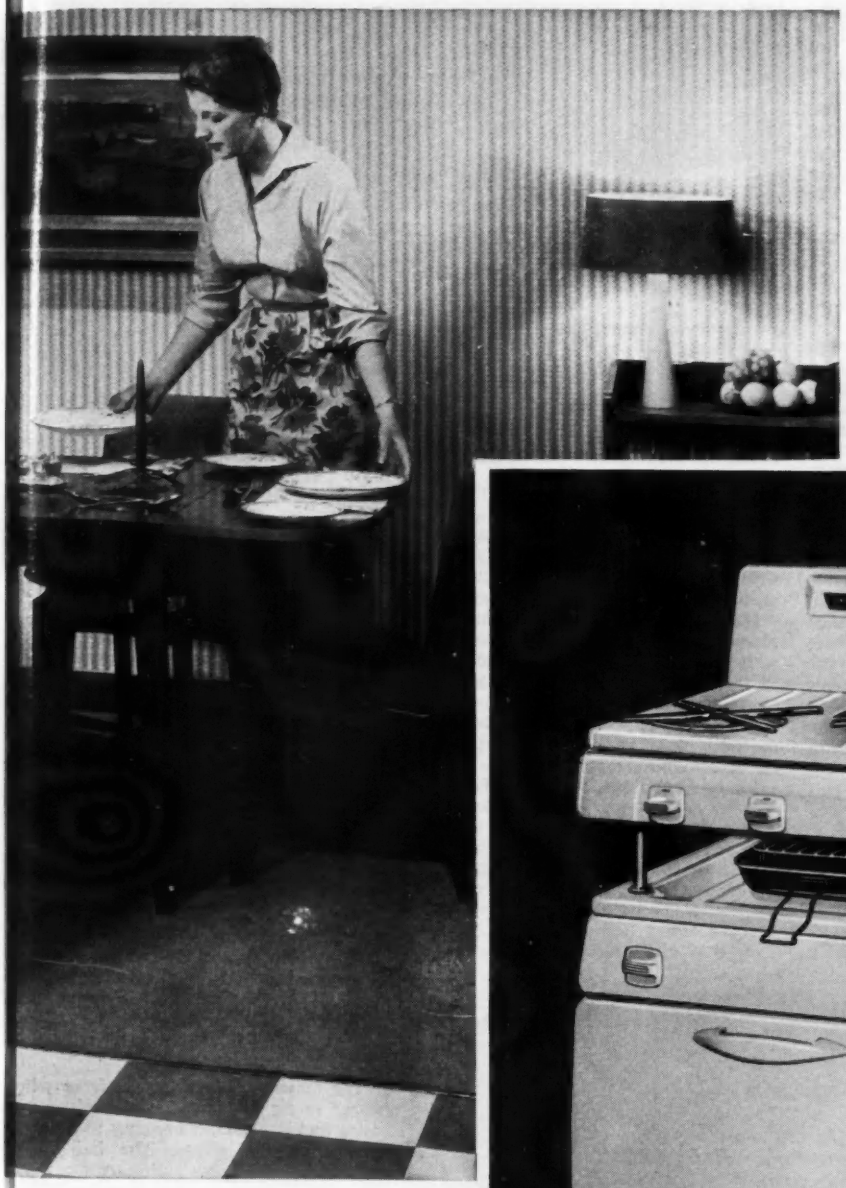

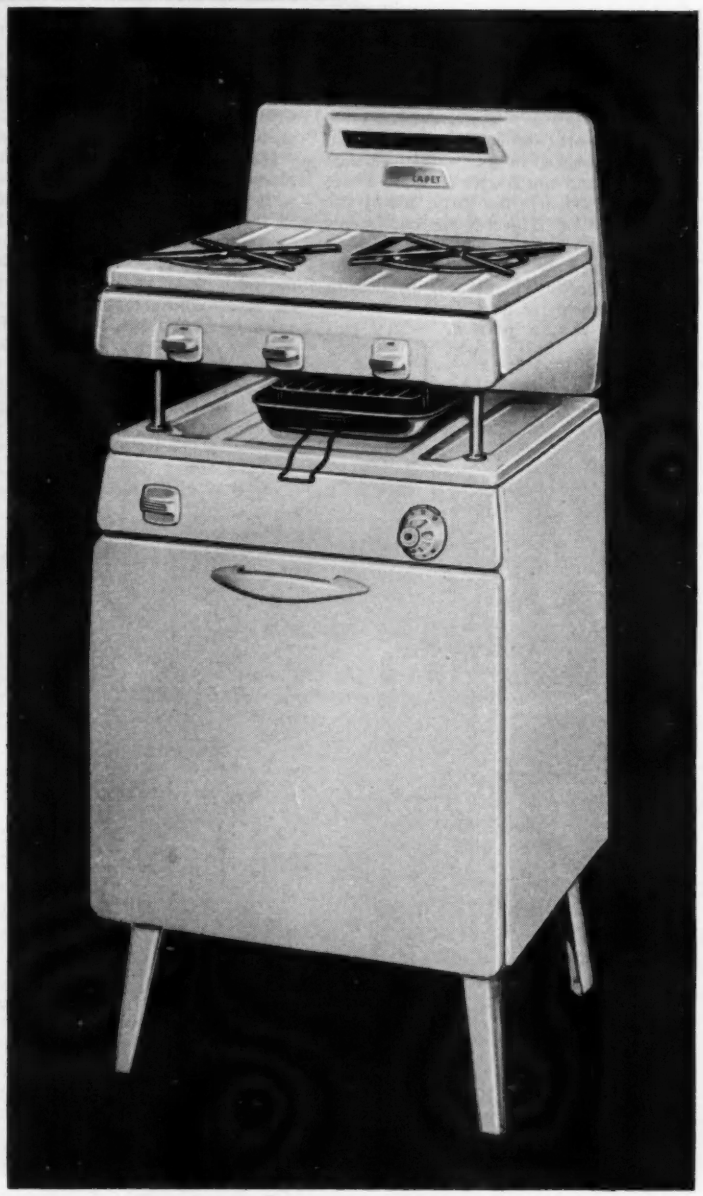

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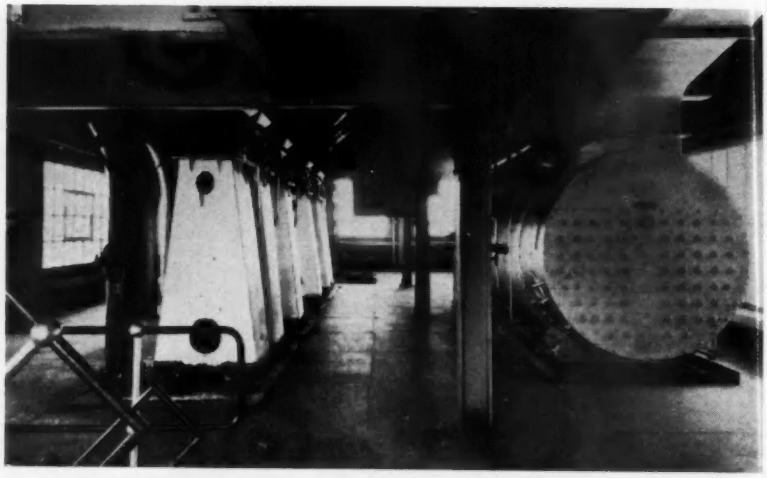
All plant—except for the electrically operated retort house lift—is driven by steam. This includes the exhausters, two of which are of the Waller 'rotary' type of 25,000 and 15,000 cu.ft. per hour capacity, and a new 'Roots' type of 30,000 cu.ft. per hour capacity installed in 1948 and driven by a 'Reader' single cylinder vertical steam engine. The exhauster house was reconstructed in 1948. The set-up includes a small showroom and office for the payment of accounts and a headquarters for the district service manager who is responsible for the manufacture and distribution of gas in his district.

At the Kilmarnock works, on the edge of the Glasgow industrial area but not really part of it, there have been extensions in the carbonising plant capacity. The extensions so far built comprise 16 50-in. Glover West continuous vertical retorts with a capacity of 1.75 mill. cu.ft. per day, in two 'balanced heated' settings of eight retorts built in silica material and heated by two pressurised step grate producers, with provision for a similar extension in the future.

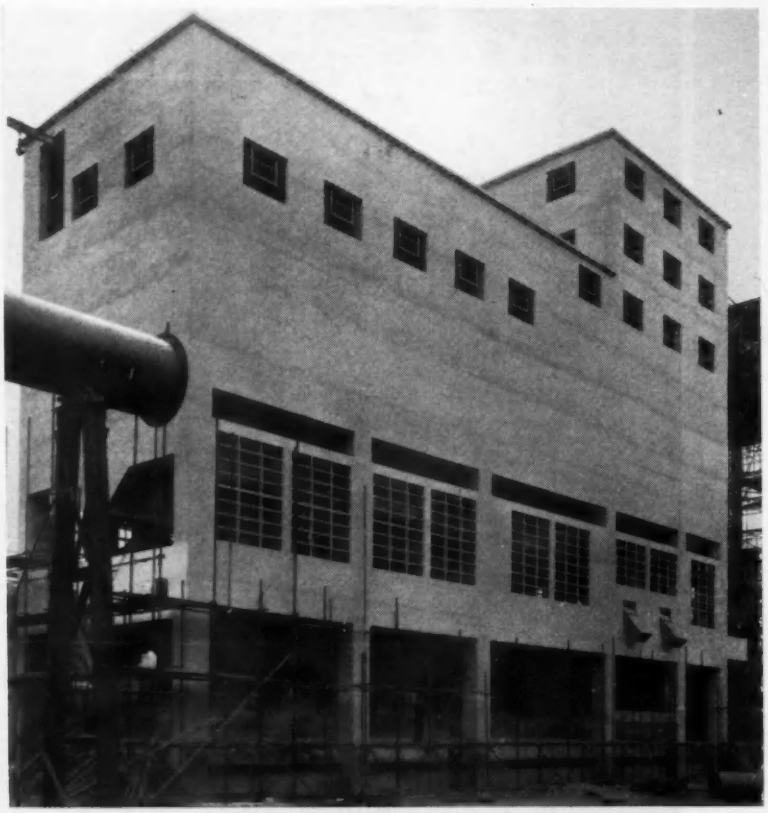
At this works the carbonising plant in the past consisted of intermittent vertical chambers and horizontal retorts. These were superceded in the early '30s by the first bench of Glover-West continuous vertical retorts in three beds of eight retorts which were constructed in the old retort house. The recent installation of retorts has involved some very neat designing on the part of West's Gas Improvement Co. Ltd. which has placed the new extension in position complete with coal and coke handling gear to work independently but at the same time in conjunction with the existing plant.



Charging floor level in the retort house at Peterhead, showing coal boxes and the waste heat boiler.

Here again the coal and coke handling plants are the lip bucket elevator type, with capacities of 80 tons per hour and 31-35 tons per hour, respectively. The total coal consumption is 200 tons a day, 80 tons of which are processed by the new plant. Coal is brought up to the retort house bunkers, which have a capacity of 48 hours running at full output, by two 36-in. belt conveyors and one standby, while run of retort coke is brought up in its lip bucket elevator and discharged on to a corresponding 36-in. belt conveyor. With the alternative routes to the scurfing bunker or the producer fuel bunker, this coke is fed on to a corresponding belt conveyor on the existing carbonising plant by which it is in turn transported to the screening plant.

The top iron work is the normal standard installation, showing a slightly smaller coal box and the low level collecting main compared with the existing plant. Waste heat is recovered by a Spenser Bonecourt waste heat boiler capable of raising 5,800 lb. of steam per hour at 120 lb. per sq. in. This boiler is fitted with a turbo driven Sirocco extraction fan powered by a Greenwood and Batley steam turbine, a unit superheater, thermofeed and Hilo water safety devices. A water preheater is also fitted. This boiler is big enough to deal with waste gases from the ultimate four settings of retorts.



The new screening plant at Provan.

The maximum day's output from this works so far is 3 mill. cu.ft. but this is rising and has made it necesary to extend the gas-making plant. The industrial load is rising as more and more firms in the neighbourhood turn to gas for heating, but perhaps more important than this is the scheme for linking up a number of small works to the South of Kilmarnock. The laying of this main is now in progress and when complete a number of small undertakings will be closed down and become holder stations, supplied from Kilmarnock. This policy of linking up small obsolete undertakings wherever possible is being followed when the position of such small undertakings is near enough to some large centre of gas production which can be enlarged if necessary to deal with the added load.

The plants described so far have lately been commissioned and are actually making gas. The Scottish Gas Board are, however, carrying out considerable extensions at Provan gasworks which is one of the works supplying Glasgow. Glasgow is the largest city in Scotland

and four large works supply the major part of its gas requirements. These works are comparable in size to the large works found in England, as is also the Granton gasworks in Edinburgh, which is the largest in Scotland.

The present carbonising plant at the Provan works was built after the first war by the Woodall-Duckham Construction Co., Ltd., and was formally opened by the Lord Provost of Glasgow on September 28, 1922. It was the largest plant in the British Isles under one roof and possibly the biggest in Europe, and consisted of 192 downward heated retorts of seven tons capacity in eight benches of 24 with an output of 16,272 mill. cu.ft. per day. It was an addition to an already existing horizontal plant with a planned capacity of 12 mill. cu.ft. per day and built in 1904.

This C.V.R. plant was the very latest design in its day, with retort settings built in fire clay which decided the temperature at which the coal could be carbonised. In fact each seven-ton-per-day retort was only capable of producing between 88,000 and 100,000 cu.ft. of gas per day, but the plant was big enough to have the latest means of mechanical handling installed, and with certain exceptions, namely the exhausters, boosters, and certain parts of the scrubbing plant, electric drives were fitted throughout. The No. 6 bench was rebuilt in 1954.

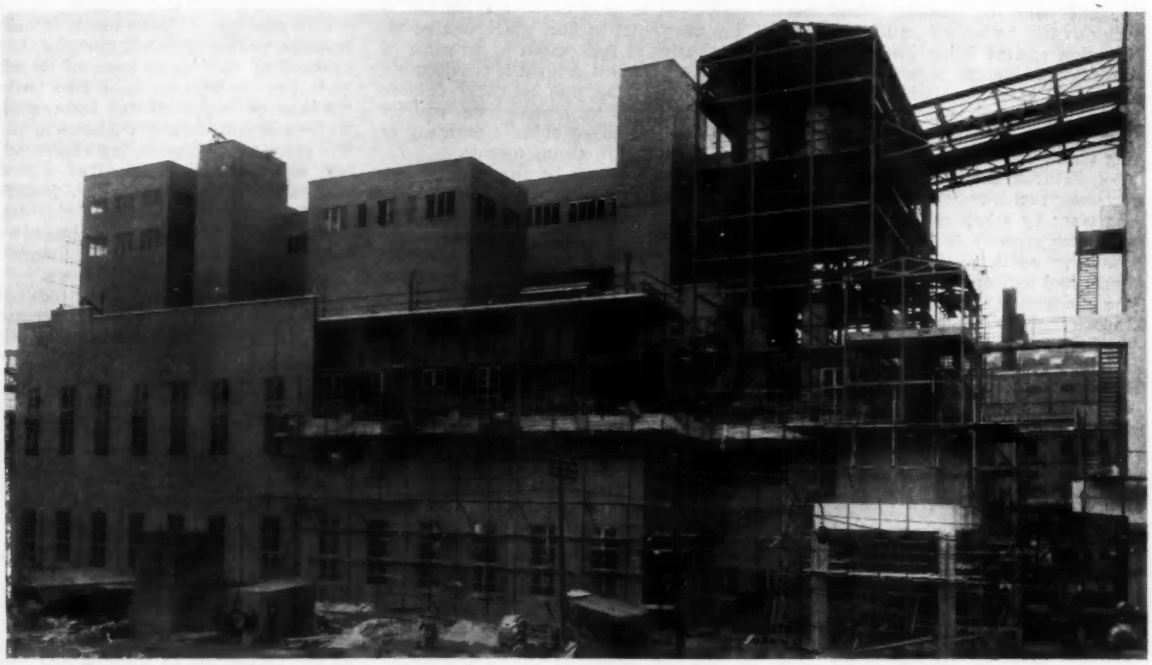
The plant now under construction is also being built by the Woodall-Duckham Construction Co., Ltd., on the site of the old horizontal plant. It will consist of 48 82-in. latest type silica lambent heated retorts, in two benches each of 24 retorts, with a throughput capacity of 436 tons of coal and a calculated gas make of 7.04 mill. cu.ft. of gas per day. It has been possible to make use of existing ancillary plant with few additions. A new C.W.G. plant consisting of two 4 mill. cu.ft. per day sets is also being installed as part of the new gas-making programme by Humphreys and Glasgow Ltd. The site on which this plant is being built was originally occupied by coke loading plant to handle the coke from the old horizontal retorts. Here, too, was located an external producer plant.

A good deal of civil engineering work has been necessary. This is specially true of the western end of the new retort house where the coal handling arrangements are being brought up to date to enable coal to be tipped on to an underground belt conveyor system to transport it into the retort house to the foot of the new gravity bucket elevators now being installed. This will save a good deal of valuable space since the conveyor belts will run underneath the coal store.

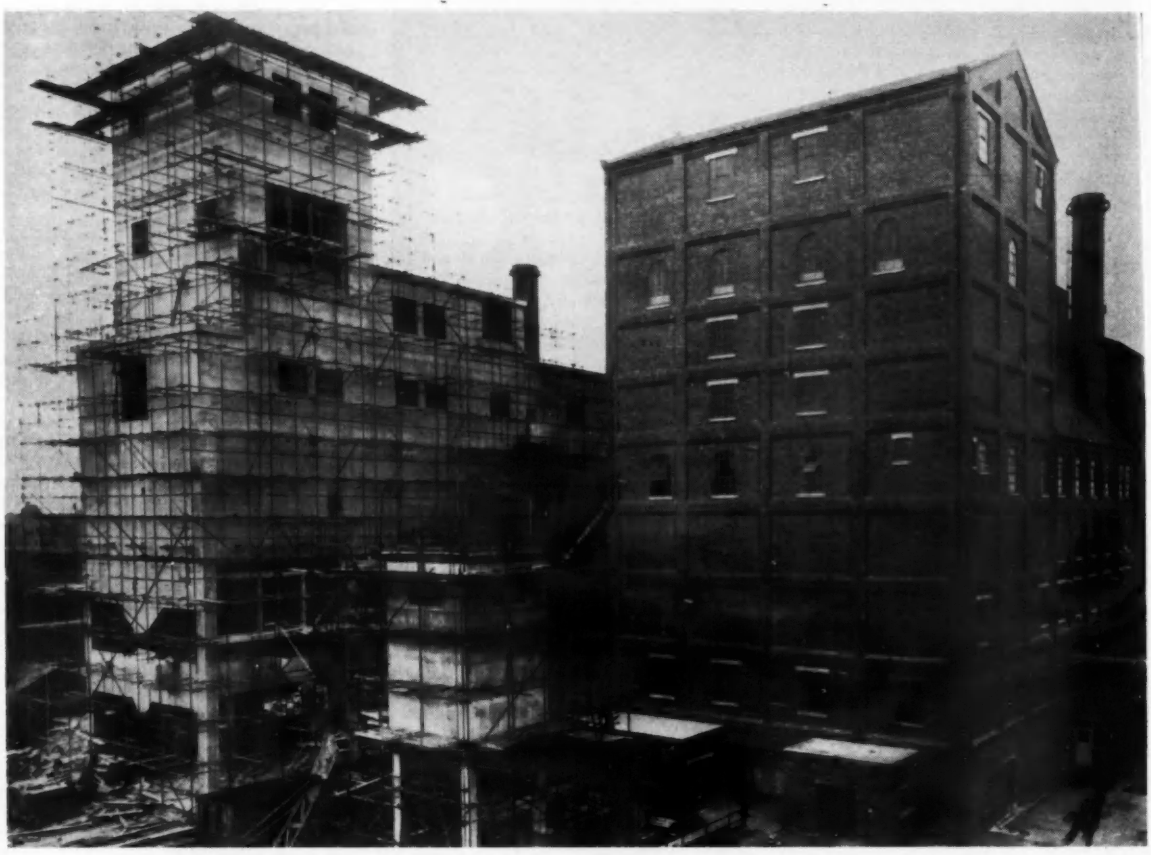
The carbonising plant of 48 82-in. Woodall-Duckham retorts is divided into two benches of 24 retorts and subdivided further into six sections of four retorts which will allow independent working and greatly facilitate resetting or repairs to any section with the smallest possible interference to gas-making as a whole. Producer gas for retort heating is made in three mechanical producers, manufactured by Humphreys and Glasgow Ltd., one for each bench with one as a standby; connections will be so arranged that any producer can be used for any bench. An Askania steam driven governor controls the producer gas pressure. Coal is brought to the elevated sidings to the west of the retort house and discharged by side tipplers, which can take wagons of up to 25 tons capacity at a maximum rate of 80 tons per hour, into a receiving hopper; this has two bottom outlets from either of which vibrating feeders pass the coal by way of single roll coal breakers, which can be by-passed, to belt conveyors. These pass through a tunnel under the coal stocking ground and discharge the coal through rotary fillers to the foot of duplicated gravity bucket elevators, which encircle the west end of the retort house.

Coal may be recovered from stock by crane discharging into the tippler hoppers. At the top of the gravity bucket elevator, coal is discharged on to two belt conveyors which in turn feed two shuttle conveyors to distribute it to the retort house bunkers. With a consumption of 9.1 tons per retort per day, these bunkers will hold enough coal for 60 hours' running. Top iron work is the normal pattern as fitted by the Woodall-Duckham Company. A Bryan Donkin retort house governor is installed to control the off-take gas pressure. The coke extractors are driven by either an electric motor or an enclosed type steam engine, situated in an adjacent end bay. The steam drive works on 120-160 lb. per sq. in., and has a 20% speed variation. The coke chambers, which can hold two hours' make of coke, have the standard water sealed discharge doors. Cooled coke is delivered by a hand propelled travelling coke chute to duplicate belt conveyors running under both benches to the bottom of duplicated gravity bucket elevators encircling the east end bay of the retort bench. These deliver coke to the retort house coke bunkers or to a belt conveyor to the new coke screening plant.

The coke handling plant consists of two sets of scalping and grading screens and coke storage of 600 tons. Four sizes of coke and breeze will be available and can be stored in varying quantities:



The new retort house at Provan under construction.



The new retort house (right) and the new screening plant (left) under construction at Aberdeen.

45 tons of ½ in. to 1¼ in., 320 tons of 1 in. to 2 in., 115 tons of over 1¼ in., and 120 tons of 0-¼ in. breeze. On one side of the new screening plant railway wagons will be loaded while road vehicles will be loaded on the other, debreezing screens being installed on the coke hopper outlets. Sizes ½ to 1¼ in. and 1 in. to 2 in. are available for producer fuel. Provision is also being made for installing at some future date a dedusting screen for separating the fine breeze (0-⅛ in.) from the coarse breeze (0-½ in.). Producer fuel is brought from the screening plant by a belt conveyor of 30 tons per hour capacity to the gravity bucket conveyor which elevates it to the producer fuel bunker, which is placed above the mechanical producers, and has a capacity of 30 hours working for two producers. An electrically operated producer charging skip runs on an overhead track and is equipped with a weighing machine and totalisators for weighing producer charges. Ash and clinker are removed by three hand propelled skips with detachable bodies which are elevated by a 3-ton-per-hour ash skip hoist to an ash storage hopper which can hold 45 tons. Coke can be brought in from the coke handling plant by a 40-ton-per-hour conveyor to the scurfing bunkers in the retort house. From these bunkers, each of seven tons capacity, there being two for each bench, coke is taken by hand propelled skips travelling on rail tracks to the retort to be filled.

There are three waste heat boilers, each big enough for one bench of 24 retorts. Normally two boilers will be in use with one standby but all three can be employed if need be by making use of the augmentation flue, which will be the equivalent at full output of an extra 16 retorts. Natural draught is provided but normal working will be under induced draught by 32 in. Sirocco fans, one for each boiler, driven either electrically or by a 24 B.H.P. steam turbine.

Feed water will be supplied by two Weir feed pumps capable of delivering 2,060 gal. per hour of preheated water. Superheaters will be provided to give a 100°F. superheat. All steam raised in these waste heat boilers will contribute to the main works steam supply; as a later development it may be used for generating electricity in a turbo-alternator. It is anticipated that there will be an export of steam at 160 lb. per sq. in. of 10,000 lb. per hour.

The amenities for the stokers are well looked after, and rest rooms and a bathroom are provided at the charging floor level. The retort house and coke screening plant are equipped with a vacuum cleaning plant and a dust extraction plant reduces the dust under the retort setting while coke is being discharged. Cold air circulating plants are provided at the top damper platform level on each bench.

Additional ancillary plant is to be installed for this new carbonising plant and consists of a pair of water tube condensers by Newton Chambers & Co., Ltd., each with a capacity of 4 mill. cu.ft. per day, and a Holmes Connersville meter with a P.V.T.T. instrument of 8 mill. cu.ft. per day capacity.

The new C.W.G. plant which is being installed by Humphreys & Glasgow, Ltd., consists of two units, each of 4 mill. cu.ft. per day with provision later on for the use of heavy oil for carburetting. This plant will work in conjunction with the present C.W.G. plant, but otherwise it will be completely independent, with its own tar disposal plant which includes overhead storage for direct rail tank loading and shipping. The plant will have a separate meter, a wet purification plant, and its own exhauster house.

The capacity of the reinforced concrete purifier stream is being increased from 12 mill. cu.ft. per day to 18 mill. cu.ft. per day by adding two sets of five concrete purifier boxes.

To handle the extra gas which will be made at the works, together with an increased volume of coke oven gas which it is proposed to import, new booster plant is being installed consisting of three 750,000 cu.ft. per hour at 6 lb. per sq. in. boosters, with provision for a fourth machine.

The gas-making plant at Aberdeen is the only sizeable plant on the Northern Division of which it is the headquarters. This division is the most scattered and extends over a larger area than any other section of the Board. It includes at its extremities gas-making plant in Orkney

and Shetland as well as the outer Hebrides. Other smaller undertakings to the north and south of Aberdeen will be linked wherever possible to form a local interconnection; though hardly a grid, this will provide a useful means of improving the load factors and of assisting a station undergoing large resetting or maintenance repair programmes to meet its gas load. Pressure may be improved as a result of combined gas-making resources which may have the effect of stimulating demand and in turn of improving the overall manufacturing load factor.

Fall in Price

Gas at Aberdeen was first manufactured in 1824 by the Aberdeen Gas Light Company, which produced an oil gas, to be superseded four years later by coal gas. The chief result of this was a fall in price from about 50s. to 15s. per 1,000 cu.ft. The original works was near the present railway station approach and the name, Gas Street, for the station approach, still perpetuates the old site. After amalgamating with its rival, the New Gas Light Company, gas-making was concentrated on the present site at Sandilands and the old site abandoned. In 1871, the gas undertaking was bought by the Municipality. At the time of the purchase it had an output of 120 mill. cu.ft. per year, which has shown a steady expansion to the present 2,728 mill. cu.ft. per year.

Expanding demand made extensions necessary and from 1913 onwards units of continuous vertical retorts were added as needed. All these installations are by the Woodall-Duckham Construction Co., Ltd. In 1924, when the second vertical retort unit was installed, there were still 432 horizontal retorts. By 1930 these had given way to a third battery of continuous vertical retorts. The total capacity of the carbonisation plant now stood at one bench of twenty 5-ton retorts in five settings of four retorts, twenty-four 7-ton retorts in six benches of four retorts, and twenty-eight 103-in. downward heated retorts to be split later in two benches of 14 and 12 retorts. A further bench was added in 1951 and consisted of twelve 103-in. retorts; a final bench of sixteen 103-in. downward heated retorts is now under construction, and will be completed this year. The total gas-making capacity will then be 14¼ mill. cu.ft. per day.

Confined Site

The site of the works is very confined and only occupies an area of 9¼ acres which makes further extension difficult, but space has been left between the fourth and fifth retort houses in which a further bench may be constructed and full use made of existing coal and coke handling plant. In fact, so confined is the site that extra land has had to be purchased across the road on which to stock coal. On the works itself are three gasholders, each of .5 mill. cu.ft., which is inadequate for a works of this size, so holder sites have been built elsewhere in the city to contribute to the overall storage capacity. There is a 3.75 mill. cu.ft. holder at Gallowhill to the north complete with a high pressure booster of 200,000 cu.ft. per hour at 6 lb. per sq. in.; a holder of 100,000 cu.ft. at Scatterburn; and a new 3 mill. cu.ft. four-lift spirally-guided holder at Tullos to the south east. Here also is a booster plant for feeding the ring main from which the distribution system in Aberdeen is based.

The new plant of sixteen 103-in. downward heated retorts, which will be completed this year, is contained in a modern well designed retort house and is capable of producing 2.55 mill. cu.ft. of gas at 425 B.Th.U. per cu.ft. The retorts are set in double line with air ventilated division walls, dividing the bench into four sections each of four retorts, and the setting is equipped with a cold air douche plant to improve the ventilation in the retort house and the operating platform. Each section is independently controllable. Four step grate producers form an independent battery and any producer can provide any section of the retort setting with producer gas. Run of retort coke may be used in these producers.

Board's Locomotives

Coal is brought into the works by the Board's own steam locomotives by rail from the railway station or the harbour on a track laid in the street and along the harbour wall. It is tipped into receiving hoppers, from which vibrating feeders discharge it to belt conveyors, by four W. J. Jenkins & Co., Ltd., electrically operated end discharge ram type wagon tippers designed to tip wagons up to 21 tons. These belt conveyors form two streams, each of 100 tons per hour, which pass under the retort house floor and transport coal via British Jeffrey Diamond Mark II coal breakers to twin gravity bucket elevators. By this means coal may be delivered to the present No. 3 and No. 4 installations by one stream, and to No. 5 and to the future No. 6 installation by the other. Coal can be delivered by the existing No. 3 coal handling plant to Nos. 3, 4, and 5, and the future No. 6 plant.

Emergency Gear

The gravity bucket elevator, which is fitted with Tecalemit-W.D. automatic lubrication and equipped like all the other conveyors with emergency stop tripwires, transports the coal to the overhead retort house bunkers by means of a belt conveyor feeding shuttle conveyors. By the provision of duplicate shuttle conveyors Nos. 3 and 4 plants can be fed from this gravity bucket elevator or No. 5 plant from Nos. 3 and 4 plants.

The coke extractor gear is worked hydraulically, with an emergency steam standby. A stop restricts the movement of the hanger so that the coke with which the retort has been filled after scurfing does not flow too freely. The coke, which is discharged into skips, is transported by battery driven electric locomotives and discharged from bottom doors into the boot of a Jenkins twin skip hoist of 40 tons per hour capacity to a buffer hopper above the new coke screening and storage plant. The coke handling plant which serves the present carbonising plant is fed by a telepher which directly elevates the coke skip and discharges it into the coke grading plant. This system can also be used for the new plant though it would not be possible to transport coke from the existing carbonising plant to the new coke screens since the electrically operated locomotives are supplied with power by overhead conductors which for safety's sake have not been installed for the new plant.

New Screening Plant

The new screening plant consists of duplicate lines of screens, each capable of dealing with 40 tons of coke an hour, and comprising single deck vibrating Pegson scalping and debreezing screen and Jenkins' 'consort' grading screens. The coke storage bunkers are of 800 tons capacity and are divided in four compartments to store the following sizes: Breeze, 0 to ¼ in.; No. 3 coke, ¼ in. to 1¼ in.; No. 2 coke, 1 in. to 2 in.; No. 1 coke, over 1¾ in. At the bottom of the bunkers, coke is delivered by chutes over debreezing screens to road vehicles for bulk loading or to Belle Isle bagging and weighing machines. In the same way debreezed coke may be loaded into rail wagons.

Coke for the retort house producers may be fed from the coke buffer hopper by rotary feeders by way of a chute to a belt conveyor which transports it to the retort house producer fuel bunker or alternatively to a shuttle conveyor for transport to the scurfing bunker. Coke may also be delivered to Nos. 3 and 4 carbonising plants. The producer fuel bunker has a capacity of 58 hours.

The new carbonising plant will be provided with one Spencer-Bonecourt waste heat boiler raising steam at 100 lb. per sq. in. This boiler will be equipped with the 'thermo fed' and 'Hilo' water safety devices and soot blowers of the Clyde type. Induced draught will be by a Sirocco electrically driven fan. The capacity of the feed water pumps will be 1,450 gal. per hour with a feed water tank of 150 gal. Feed water heaters are also being installed and by means of a reducing valve, steam may be led directly to the base of the retorts for steaming.

The ancillary plant with certain exceptions is adequate for the immediate future needs and is maintained in excellent repair. The very confined space in which the works is situated leaves no place for outmoded and inefficient plant, and since the war extra plant of a greater capacity has gradually been installed, culminating in 1953 in the new 4.3 mill. cu.ft. per day purifier plant to replace the old 2.3 mill. cu.ft. per day set.

Few Additions Needed

The only new ancillary plant it has been necessary to add is a water tube condenser of 5 mill. cu.ft. per day capacity, together with a Holmes-Connersville exhauster of 300,000 cu.ft. per hour in a new exhauster house built on the site of the old mess rooms. Here two other similar machines will be installed at some future date.

From a paper to the Scottish Gas Board Area Staff Conference, 1957

Integration Study

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THE area of the Scottish Gas Board covers a total of more than 30,000 sq. miles, including the Outer Isles—several times greater than that of any other gas board. This fact, however, should not be allowed to imply that large-scale integration of gas undertakings in Scotland is out of the question, for a closer study reveals that nearly 90% of the total gas sold in the Board's area is consumed in the central industrial belt bounded approximately by Ayr and Dumbarton in the west and by Arbroath and Edinburgh in the east, and covering an area of 4,000 sq. miles. Within this area is concentrated a population of 3½ mill. people, compared with rather more than 5 mill. people for the whole of Scotland.

Large-scale integration of gas supplies within the industrial belt, therefore, becomes a problem similar to that already encountered in the area of several other boards and solved by integration of supplies and centralisation of production at large works. Broadly speaking, it can be said that the Scottish Gas Board have two major technical tasks to face: The first—common to many boards—is concerned with the supply of gas to densely populated industrial areas: the second—peculiar to Scotland and perhaps to a lesser extent to Wales—is concerned with the maintenance of an efficient gas supply at small, isolated gas undertakings which are too remotely situated to be considered for integration.

Two Major Grids

Within the industrial belt there are at present 75 gasworks. This paper shows that the future proposals for the integration of gas supplies within the belt include the construction of two major grids. These are, respectively, the West of Scotland grid which will serve Glasgow, Renfrewshire, and substantial areas of Lanarkshire and Ayrshire; and the East of Scotland grid which will serve the counties of Fife, Perth, Angus, Kinross, and part of Kincardineshire.

These two grids differ fundamentally in design and it will be the ultimate intention to connect them by means of a steel high-pressure main. Together the grids will supply more than 68% of all gas sold in the Board's area. Initially the need to connect the Edinburgh works to either of the systems is not urgent, but at a later date a connection from the interconnecting steel main will probably be made. The Edinburgh works supplies 15% of all the gas in Scotland and the smaller works in the industrial belt supply a further 7%.

In the remaining parts of the area beyond the central industrial belt, covering approximately 26,000 sq. miles, there remain 69 gasworks which together supply the remaining 10% of the Board's output. With the exception of Aberdeen, which has an annual make of 2,720 mill. cu.ft., they are all small works and integration becomes a difficult matter owing to the very long distances and the very small outputs involved.

The River Tay and the Firth of Forth represent two considerable obstacles to the construction of a grid mains system on the east coast. A proposal is under examination for laying a steel main across the River Tay by means of the Tay Bridge which is approximately 2 miles in length; and the possibility of accommodating a steel main in the new Forth road bridge is being investigated.

The study of the integration of gas supplies in Scotland is a fascinating subject and it has been approached from a dual standpoint. First, there is the need to lay grid mains for the purpose of supplying gas from the large and more efficient works to the small uneconomic undertakings, thus enabling gas manufacture to cease. Second, and of great importance, it is necessary to investigate the sources of gas supply which are or may be available, other than gasworks, with a view to incorporating any such supplies in the general integration plan, thus enabling the coal used at gasworks to be reduced, with a consequent saving of fuel in the national interest.

There are several steelworks in the central industrial belt where large quantities of coke-oven gas are produced. In some cases useful quantities of gas may be released by using fuel oil or creosote-pitch mixtures in the heat treatment furnaces. Blast furnace gas is generally employed to dilute coke oven gas to the required calorific value. It can also be used for under-firing the ovens, and so release rich gas for sale. A limited quantity of gas may become available from the National Coal Board's coke ovens at Dumbreck. Natural gas is found in limited quantities at Cousland, near Edinburgh, and steps are being taken to utilise the gas for town supply. Methane may become available from the Cardowan Colliery, near Glasgow, and other collieries. The possibility of large-scale production of gas from liquid products which can be made available from the Grangemouth oil refinery is under examination. Refinery gas or tail gas is not expected to become available from Grangemouth refinery but, should circumstances change and refinery gas become available, advantage will be taken of any such supplies. Liquefied petroleum gases such as butane and propane from Grangemouth refinery are suitable for peak load gas production, and the first plant of this type has now been installed at Armadale gasworks. The gasification of low grade coal in plant of the Lurgi high-pressure type employing oxygen is under examination. Preliminary investigations are being made into the possibility of utilising imported liquid methane for town gas supply.

Some of these sources of gas availability are already existing, or planned to come into being shortly, and provision can be made for their inclusion in the grid systems to be constructed. Others are rather more nebulous, but the position regarding these is being investigated.

Substantial Sources

Coke oven gas, methane from mines, liquefied butane and natural gas availability though quite substantial, is not sufficient in magnitude to replace more than approximately 20% of the Board's present overall coal gas production. The recognition of this fundamental fact is of importance in the planning of future gas production plant, since it reveals that coal carbonisation will form the major proportion of gas production unless and until one of the nebulous sources of supply referred to below becomes a commercial proposition. These include the large-scale production of gas from residual oil products; the production of gas by the high-pressure gasification of inferior non-caking coal; and the importation of liquid methane. Any one of these processes could, if economically successful, replace a further 25% of the Board's present coal gas production, but these processes cannot be expected to come into operation in less than five years.

What is certain, however, is that if the fullest use is made of the known and anticipated supplies which may become available from all these sources, a system of grid mains must be provided, capable of receiving and distributing volumes of gas from whichever source may be decided upon now or in the future; and in the design of the grids referred to later, this requirement has been kept well in mind.

At vesting date there were 196 gasworks in operation in Scotland, including the coke-oven gas purification station at Hollandhurst, near Gartsherrie. At April 1, 1955, this number had been reduced by 29, an average of almost five works per

year over the six-year period. From April 1, 1955, to March 31, 1957, a further 23 works ceased production consequent on the receipt of a bulk supply, leaving 144 works in operation.

The works which have ceased production included Dalmarnock and Renfrew which were manufacturing respectively 800 mill. cu.ft. per annum and 170 mill. cu.ft. per annum. The remaining 50 works were, however, small in size averaging 35 mill. cu.ft. per annum in output. They were inefficient and uneconomic in operation, but this need be no reflection upon the management of the undertakings concerned, for the steady increase in the costs of coal, wages and salaries and other materials during the years since vesting date has had a more adverse affect upon the cost of manufacture at the small works than at the large works. There is also the increasing difficulty of obtaining the reliable and conscientious type of labour necessary for the small works. The result has been to impose a crushing burden on the small works, making them incapable of competing in the modern fuel market. The position cannot be expected to improve and the economic case for integration and centralisation of manufacture at larger stations can be expected to become even stronger during future years.

Turning to the future and attempting to estimate the rate at which gas production will cease at small works consequent on the receipt of grid supplies, the picture is reasonably clear. The proposed system of grid mains to be constructed, and referred to later in this paper, will enable gas production to cease at a further 69 works by April 1, 1962, while a further 14 works can cease production by April 1, 1967. Of the 61 works which are to remain in operation, 36 must be considered as either too remote for integration or too financially unattractive for a grid supply to be considered. The remaining 25 works will be of sufficient size and importance to achieve the highest efficiency of production and to ensure the maximum economy in operation. Of these works, 19 will be in the industrial belt.

A word of caution is necessary here. The integration proposals are based on a number of assumptions and it will be evident that uncertainties exist which must be resolved before a clear picture of future development can be drawn. In common with most other gas grids which have been constructed in the last few years, modifications and alterations to the schemes will inevitably take place during the constructional period. The assessment of future gas demand is of vital importance in the planning of integration systems. If too pessimistic a view is taken of the future trend then grid mains insufficient in size may be laid down which are incapable of meeting future increases in gas demand should they in fact materialise. On the other hand, if an over-optimistic view is taken, excessive capital commitments may be incurred in oversized mains and plant which may never earn their keep.

Falling Sales

The picture of gas sales in Scotland over the past few years is not such as to inspire over-optimism; the overall sales for the Board's area for the year ended March 31, 1956, shows a decrease of 1% as compared with the year ended March 31, 1951. Over the years, and in the face of intense electrical competition, many factors could have contributed to this, however, including shortage of production plant, insufficient distribution capacity, inadequate pressures and the disappointing results of sales promotion and sales effort.

The vital importance of achieving increased sales in the future cannot be over-emphasised. Large capital expenditure is involved in the Board's major schemes and if the maximum benefit is to be achieved, increased gas sales are essential. In the knowledge of future integration proposals it is possible to draw up a list of the works which will cease production and to classify them as: A, gasworks to cease production by March 31, 1962; B, gasworks to cease production by March 31, 1967; and C, gasworks to continue permanently in production.

As a result of this knowledge it will be possible to programme for the minimum of capital expenditure for the works in categories A and B in view of their limited life; whilst works in category C can be planned and operated with a view to obtaining the most economic permanent results. The categories referred to above will not be inflexible in so far as it may be necessary to close certain works at an earlier date than originally proposed or, alternatively, to continue in production certain works for a longer period than at present proposed. But the most important thing is to have a plan which will be sufficiently flexible to allow for modification and/or alteration should it become necessary to make variations or alterations owing to changing circumstances or altered economic conditions in the future.

High efficiency of gas production at gasworks goes hand-in-hand with integration proposals; and as a result of the reduction in the number of smaller and less efficient works it will be possible to improve the overall efficiency of gas manufacture in the Board's area. Integration will also enable selected gasworks to operate under base-load conditions, whilst variations in gas demand within an integrated system can be taken up by the operation of suitable peak-load plants at those works best suited to do so.

No paper which attempts to consider the integration of gas supplies in Scotland would be able to do so without reference to the coal resources available. The types of coal which are received by the Board can be classified broadly as low rank coal with very poor caking properties; high volatile coal with medium caking properties; and strongly caking coal. The two former types are Scottish coals, while the latter type is received from both Scottish and English pits. The coals received by the Scottish Gas Board during the year ended March 31, 1956, classified according to their rank, were as follows:

Scottish Coals (to nearest 1,000 tons).

Dross	...	...	2,000 tons
Rank	600	...	567,000 tons
Rank	700	...	368,000 tons
Rank	800	...	304,000 tons
Rank	800/900	...	899,000 tons
			2,140,000 tons

English and Foreign Coals (to nearest 1,000 tons).

Rank	500	...	164,000 tons
Rank	600	...	162,000 tons
Rank	700	...	15,000 tons
			341,000 tons

The cost of transporting coal from England is very high and inevitably increases the cost of gas produced. This is an incentive to find new sources of gas supply in order to release English coal. The type of coal received by an area board determines to a great extent the type of gasmaking plant to be used. There is no indication that the Board will receive increased quantities of caking coal in the future; in fact, the position is the reverse and the supplies of low-rank poorly-caking coal appear to be increasing, whilst the supplies of medium-caking coal appear to be diminishing. The coke produced from low-rank coal is very reactive to steam, but the breeze formation is unfortunately high. The large deposits of non-caking coal and open-cast coal in the County of Fife lead one to the examination of these coals for complete gasification purposes, and it will be seen later in this paper that mention is made of the possibility of gasification under pressure of open-cast non-caking coal from Westfield (formerly Bogside).

During 1955-56 the Scottish Gas Board sold 791,000 tons of coke and 199,000 tons of breeze. Of this total 62,000 tons of coke and 131,000 tons of breeze were exported, while the remaining coke and breeze were used within Scotland, mainly for industrial purposes. With the increasing tendency to consider the adoption of smokeless-fuel zones it is natural that attention should be directed towards the preparation and supply of a suitable domestic fuel for this purpose, and the future for coke may be promising. Against this, however, there is the fact that if coke-oven gas supplies are accepted the resultant reduction in coal carbonisation will reduce the amount of coke made. Reference is made elsewhere to the possible saving of 500,000 tons of coal per annum which will be achieved by taking an additional 25 mill. cu.ft. per day of coke-oven gas. This will consequently mean a decrease of approximately 225,000 tons of coke and breeze for sale.

It therefore becomes important to determine the extent to which increased coke availability is possible from existing plant, and it was with this aim in mind that recent tests were carried out on the carbonisation of Scottish low-rank coals by increasing the calorific value of the gas produced. It is known that by increasing the calorific value of gas produced from continuous vertical retorts, an increase in throughput of coal

is obtained and hence the coke available for sale is increased without increasing the gas made for sale. It was not known, however, to what extent it was possible to increase the calorific value of gas from low-rank coals. The tests carried out have shown that it is possible to increase the calorific value of gas produced from continuous vertical retorts above the present average calorific value, and this could result in an increase in coke available for sale should the future coke demand make this necessary.

The West of Scotland grid covers the area from Kilsyth and Helensburgh in the north to Ayr and New Cumnock in the south and extends inland from the west coast to Lanark and Cumbernauld, covering an area of approximately 1,550 sq. miles. It embraces 41 gasworks, including the Board's coke-oven gas purification station at Hollandhurst, and the gas output was 27,074 mill. cu.ft. in terms of a calorific value of 450 B.Th.U. per cu.ft., during the year 1955-56.

The conception of a West of Scotland grid is based primarily upon the manufacture of gas at the large gasworks in and around Glasgow and upon the receipt of coke-oven gas supplies from coke ovens situated in the Glasgow area. The total length of existing and new grid mains will be 335 miles. More than 50% of the gas made and bought will be distributed within the Glasgow area but the extension of grid mains to supply undertakings as far south as Ayr (and possibly Maybole) provides an important and economical means of supplying consumers over a wide area.

Obsolete Plant

A considerable amount of works plant in the area is obsolete, and a number of gasworks are small and uneconomic in operation. The increasing quantities of coke-oven gas which are expected to become available during the next three years will enable gas production to cease at many of these uneconomic works and will allow other gasworks to operate as base-load stations following upon the receipt of a grid supply. Day-to-day variations in demand can be met by the efficient use of gasholder capacity controlled from a central grid-control in conjunction with the use of carburetted water-gas, whilst the flexibility of gas production required to meet seasonal variations in demand will be provided mainly by carburetted water gas manufacture at the larger Glasgow gasworks. The smaller carburetted water gas plants at other stations need only be put to work to meet exceptionally high demands or to meet conditions of emergency.

For estimating purposes it has been assumed that for the next few years a moderate basic increase of 1% per annum will be achieved. The effect of smokeless zones or increased industrial gas demands cannot be calculated at present, but the design of the grid is such as to provide a reasonable degree of flexibility.

A considerable increase in coke oven gas availability is expected during the next three to four years from coke ovens owned by Bairds and Scottish Steel, Ltd., at Gartsherrie and by Colvilles, Ltd., at Clyde Iron Works and at Ravenscraig, near Motherwell. The proposed grid mains system is designed to take the maximum anticipated quantity of gas from these coke ovens and to provide bulk supplies to undertakings in the area of Lanarkshire and Glasgow, with a view to enabling gas production to cease at the uneconomic works in these areas. The use of coke oven gas to replace gas produced by the carbonisation of coal at gasworks will result in a considerable saving of coal, and it is estimated that if an additional 25 mill. cu.ft. of coke oven gas per day is ultimately made available to the Board, then the resultant saving in coal consequent upon the cessation of gasworks manufacture will be in the neighbourhood of 500,000 tons of coal per annum. This is a very considerable contribution to the national fuel economy. A further possible source of gas supply is that from the Dumbreck coke ovens of the National Coal Board. These ovens are small and have a limited life, but if crude coke oven gas supplies eventually become available from these ovens, purification would be carried out at the Kilsyth works.

An important factor in the design of the grid is, however, that should all these additional coke oven supplies not materialise, or should they be less than anticipated, existing gasworks' capacity can be retained or reconstructed to supply the needs of the grid system.

Provision can be made in the design of the grid for transmitting gas from the Glasgow area as far south as Ayr, with supplies to Ardrossan, Saltcoats, and Troon, and connections to Irvine and Kilmarnock. This will enable production to cease at Troon, Saltcoats, and Ardrossan, whilst the Irvine works and the two works at Ayr will continue in production for as long as it is economical so to do. The connection to Kilmarnock will enable the works to operate on an improved load factor, exporting into the grid system during times of summer demand and importing from the grid during times of peak winter demand. The date upon which the mains referred to will be laid will depend upon economic conditions and the need for major replacements at any of the works concerned, but it is anticipated that they can be completed before 1962.

In addition to the major supplies of coke oven gas referred to, negotiations are at present taking place with the National Coal Board for a supply of methane from the Cardowan colliery, near Glasgow. This supply of methane is expected to be small in volume, but its acceptance for the purpose of replacing gas produced by the carbonisation of coal will result in a saving of fuel in the national interest. It is proposed that if and when the supply becomes available it will be transmitted through a main approximately four miles long to Provan gasworks, where it will be mixed with the large volume of coal gas made and purified at that works.

The large gasworks in the Glasgow area will play an important part in the gas production programme in the grid area. The works at Dumbarton, Tradeston, and Dawsholm will be operated on the highest possible load factor, whilst the Provan works will take up a considerable part of the day-to-day variations in gas demand by means of the carburetted water gas plants located there.

Considerable reconstruction is being carried out at Provan works including the construction of a new 7 mill. cu.ft. per day continuous vertical retort installation, new ancillary plant and purifiers, and two new carburetted water gas plants, each of 4 mill. cu.ft. per day capacity.

Three new boosters, each capable of boosting 750,000 cu.ft. per hour at 6 lb. per sq. in., will be installed at Provan works for the purpose of transmitting gas to other works in the Glasgow area. It is proposed to extend the existing 18-in. diameter main in Paisley Road to enable large quantities of grid gas to be supplied from the Helen Street holder station into the Paisley works and two new boosters each capable of boosting 500,000 cu.ft. of gas per hour at 6 lb. per sq. in. have been approved by the Board for installation at Helen Street holder station. It is proposed to install compressors at Paisley for re-compressing gas for transmission to the stations at Ayr, Troon, Saltcoats and Ardrossan.

Coke Oven Gas

The increased quantities of coke oven gas which are expected to become available in the future from the coke ovens of Bairds and Scottish Steel Limited at Gartsherrie will necessitate the construction of a new purification and compressing station in the Coatbridge area, and this station will be designed for a final capacity of 24 mill. cu.ft. per day. Provision will be made in the design for butane storage plant, capable of providing peak-load gas during the period of maximum demand or for emergency.

The coke oven gas supplies which will become available from the Clyde Iron Works of Colvilles Limited will be taken via an 18-in. diameter spun-iron main to Provan gasworks, where mixing with coal gas and carburetted water gas will take place prior to purification.

The new Ravenscraig coke ovens of Colvilles Limited, which are now under construction, are expected to be in production towards the end of 1957 and when coke oven gas supplies from this source become available, the crude coke oven gas will be transmitted to Motherwell gasworks and to Uddington gasworks through new spun-iron mains to be laid, and purification will be carried out at these two stations.

The Board have already approved the laying of certain of these grid mains and construction of certain sections has commenced, without, however, necessarily committing the design of the grid to the acceptance of coke oven gas, pending the successful conclusion of the negotiations which are now in progress.

The East of Scotland grid embraces the major part of the Central Division (the former Dundee, Perth and Fife Groups) and includes 30 gasworks extending over an area of 1,700 sq. miles. The area is divided by the River Tay which runs

through Perth to Dundee in the east, and this river forms a barrier of considerable proportions to the grid mains system. The area south of the River Tay is fairly well populated the main industry being coal mining, while the area north of the Tay (excluding Dundee) is sparsely populated, with small towns and villages scattered at infrequent intervals. This has had its effect upon the design of the grid mains system which has been planned largely on the use of small diameter mains operating at high pressure for the area north of Dundee, while larger diameter mains under somewhat lower pressures will be employed for the Fife area. Subsidence from coal-mining operations is severe in some localities in Fife and it has been thought wise to make provision in these areas for the use of steel mains to minimise fractures, whilst in other places cast iron mains with flexible joints will be used. The total length of mains in this grid will be 345 miles.

There are at present 15 manufacturing stations in Fife. Most of these are small and would require considerable capital expenditure to put them into a first-class condition for further production.

The scheme for integration in the Fife area allows for the cessation of manufacture at 12 works by 1962, leaving Dunfermline, Kirkcaldy, and Levan to continue in production. Before 1967 the position will be reviewed and a decision taken as to whether all production shall be centralised at Dunfermline works, with consequent cessation of gas production at Kirkcaldy and Leven. The Board have given approval to the expenditure of £342,300 for the construction of grid mains in the Cowdenbeath area and for the reconstruction of retort settings at Dunfermline works, and this will commence during the coming year. The reconstruction to be carried out at Dunfermline will increase the gasmaking capacity of the works to nearly 6 mill. cu.ft. per day and the grid mains to be laid will enable production to cease at Cowdenbeath, Cardenden, Lochgelly, Kelty, and Kinross consequent upon supplies of grid gas from Dunfermline.

Second Stage

The second stage of integration will involve the installation of new carbonising plant and ancillaries at Dunfermline works and the laying of further grid mains to supply the remaining undertakings in Fife, with the exception of Kirkcaldy, and Leven. Provision has been made in the design of the grid for the supply of 'marginal' quantities of gas up to approximately 2 mill. cu.ft. per day to Dundee and it is proposed that this will be transmitted across the Tay Bridge by a high-pressure steel main.

Conversely, depending upon the surplus capacity which Dundee works may have available, it will also be possible to supply considerable amounts of gas in the reverse direction from Dundee into the north Fife area. An examination is now being made into the extent to which the output from Dundee works can be increased.

The grid system to supply undertakings in the County of Angus, north of Perth and Dundee, envisages the cessation of production at all works, with the exception of Arbroath, by 1962, consequent upon the receipt of grid supplies from Perth and/or Dundee works.

The future increase in gas demand in the undertakings north of Dundee is problematical, hence the design of this section of the grid may be based on the use of steel mains which will permit of increased gas pressures in the future should the demand increase.

The Board have already approved the laying of the main from Coupar Angus to supply Forfar and Kirriemuir at a cost of £120,000 and the section from Arbroath to Carnoustie at a cost of £59,000. The position with regard to gas production at Abroath will be reviewed before 1962 and a decision taken as to the ultimate date of closing this works.

Increasing attention has been given during recent months to the possibility of completely gasifying, under conditions of high-pressure, inferior quality coal of non-caking property. This type of coal is available in Fife, and the practical possibilities of such a plant have been brought nearer during recent months by the decision of the National Coal Board to work the open-cast deposits at Westfield, near Kingskettle. Such a possibility is exceedingly attractive, since not only could gas be produced economically, depending upon the price of coal, but the deposits of poor coal which would otherwise be practically unusable would replace good quality gasmaking coals, which could then be diverted for other purposes. The gas from such a plant is produced at a pressure of about 28 atmospheres and a residual pressure exceeding 300 lb. per sq. in. is available for distribution. The possibility that this type of plant might be erected in the future has been very much borne in mind in the integration proposals for the East of Scotland Grid referred to above, but it is not thought likely that the plant could be ready for gasmaking in less than four or five years.

If, in fact, the Board decide to construct a high-pressure gasification plant in Fife, the design of the proposed grid would be radically altered. To be economic, a high-pressure gasification plant might require to be of not less than 30 mill. cu.ft. per day capacity and the production of this amount of gas would necessitate the construction of a high-pressure steel main grid supplying all undertakings in the Central Division, with provision for transmitting surplus gas to Alloa, Stirling, and Falkirk and beyond; perhaps, indeed, to Glasgow. It is not possible at this stage to deal more fully with such a project, except to say that it is under examination and that in the meantime due allowance is being made in the integration scheme for the possible future installation of a high-pressure gasification plant in Fife.

In the area of the Edinburgh and South-Eastern Division there are four grid systems which are planned or in being, and these are detailed below. A scheme for a further grid system based upon Dumfries is under examination.

In the design of the Edinburgh and East Lothian grid it is proposed that gas production will be centralised at the Granton gasworks, Edinburgh, which is the largest gasworks in Scotland, having a gasmaking capacity of 36 mill. cu. ft. per day. The future proposal for the construction of the grid allows for grid mains to be laid from the Prestonpans holder station to supply Haddington, Aberlady, East Linton, Dunbar and North Berwick and, following upon the receipt of grid supplies, gas production will cease at these five works. The Board have already approved the laying of grid mains from Haddington to Aberlady and from Haddington to East Linton at a cost of £52,000 and mainlaying will commence during 1957. This will enable the Haddington works initially to supply gas to Aberlady and East Linton thereby allowing production to cease at these two places within the next eighteen months; thereafter the remainder of the grid will be completed, and North Berwick, Haddington and Dunbar works will cease production. The total length of mains in the completed grid will be 93 miles. At Prestonpans holder station a re-compressing station will be built and gas from Granton gasworks will be re-compressed and supplied to all undertakings in East Lothian.

Natural Gas

For the time being the small gasworks at Musselburgh with a capacity of approximately 1 mill. cu.ft. per day will be continued in production for the purpose of receiving supplies of natural gas from Cousland. Cousland is approximately 4 miles distant from Musselburgh and a main is presently being laid to transmit natural gas from the wellhead to Musselburgh works where it will be mixed at the outlet of oxide purifiers with the continuous vertical retort gas. The estimated quantity of natural gas available is uncertain, but it is thought that even under the most favourable conditions the amount will not exceed 2,000 mill. cu.ft. Arrangements have been made to transmit up to 150,000 cu.ft. per day to Musselburgh; and at this rate of supply it is estimated that more than 7,000 tons of coal per annum will be saved. The possibility is also being borne in mind for the future that when the well becomes exhausted, it may be possible to use the strata for the underground storage of town gas.

The Falkirk grid connecting Falkirk with Denny, Grangemouth, Polmont, Bo'ness, and Linlithgow is substantially complete and gas manufacture has ceased at Polmont and Bo'ness. It is anticipated that production at Grangemouth and Linlithgow will cease during the next 12 months. Gas production is scheduled to cease at Denny by April, 1962, but the exact date will depend upon the economics of manufacture and the rate of increase in demand. It is proposed that in due course the grid main which is now being laid from Coatbridge to Cumbermauld will be extended to enable coke-oven gas supplies to be provided at Falkirk. The total length of mains in the completed grid will be 20 miles.

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deal with small volumes of gas over fairly long distances; the total length of mains in the completed grid will be 98 miles. It is proposed that the works at Galashiels and Hawick shall continue in production and the works at Earlston, Jedburgh, Innerleithen, Kelso, Lauder, Selkirk, Coldstream, Duns and Peebles shall cease production. The Board have already approved the laying of grid mains to Kelso and Jedburgh at a cost of £73,000 and mainlaying will commence during 1957. It is intended that a small re-compressing station should be built at Kelso for the purpose of supplying, through small diameter steel mains, the relatively small volumes of gas required to supply Coldstream and Duns.

The Armadale grid was completed some years ago and the only manufacturing works in the grid is Armadale. The total length of mains in the grid is 26 miles. This is an efficient works, but threatened with the effects of mining subsidence. If, in fact, subsidence is experienced and the works forced to cease production, it is proposed to lay approximately 12 miles of steel main from a point near Coatbridge to supply coke oven gas to Armadale. Alternatively, consideration may be given to connecting Armadale to the Edinburgh grid system at a point near Broxburn.

An examination has been made into the economic and practical possibility of constructing a gas grid centred upon Dumfries and supplying Moffat, Lockerbie, Annan, Dalbeattie, Castle Douglas and Kirkcudbright. The distances involved are considerable and the undertakings to be supplied are small. Nevertheless, a preliminary examination indicates that savings in cost are to be achieved as a result of constructing such a grid. A new continuous vertical retort house has recently been completed at Dumfries, of sufficient capacity to supply economically the additional quantities of gas required for these small undertakings. This is favourable to the construction of a grid since the extra gas required for grid purposes could be obtained at very little more than 'net coal cost.' The examination of this possibility is proceeding, but for the purpose of completing the schedule of works to be retained in production, it has not been assumed that the grid will be built and the small undertakings at Moffat, Lockerbie, Annan, Dalbeattie, Castle Douglas and Kirkcudbright are shown as continuing in operation.

The Northern Division covers the largest part of the Scottish area and with the distances involved and the sparse population, no comprehensive overall integration plan is possible.

The Elgin grid scheme involved the supply of gas from Elgin to Buckie, Cullen, Banff, Keith and Huntly. The Board have approved the laying of the main from Elgin to Buckie and Cullen and substantial progress in mainlaying has already been made.

It is possible and desirable to supply several small undertakings from Aberdeen, and these include Inverurie, Old Meldrum, Banchory and Stonehaven. The connection between Inverurie and Old Meldrum has already been made and the latter works closed down. It is anticipated that grid mains may be laid to Inverurie, Banchory and Stonehaven by 1962, thus enabling gas production to cease at these works.

An examination is being made into the possibility of laying a grid main from Inverness to Nairn and another main from Elgin to Forres. The distances involved are, respectively, 16 miles and 12 miles and if these projects should appear attractive then the gasworks at Forres and Nairn would cease production before 1967. For the purpose of this paper Forres and Nairn are considered to continue in production. Ultimately there would be 17 works in production in the Northern Division, only four of which, including Aberdeen, would have an output of more than 100 mill. cu.ft. per annum.

From the outline of the proposed pattern of integration of gas supplies for the next ten years it will be apparent that a considerable measure of centralisation of production will have been achieved by 1967. During the next ten years the 'shape of things to come' should become much clearer and the supply of gas from raw materials other than coal may play an important part in the gas production programme.

Reference has been made to the examination of three possible sources of future gas production, namely, the importation of liquid methane at very low temperatures; the production of oil gas on a large scale from residual oil products in plants possibly located near the Grangemouth refinery; and the production of gas by the high-pressure gasification of inferior non-caking coals. The first and second of these processes depend upon the use of imported fuel, while the third project depends upon home-produced coal.

If any one of these three projects appears attractive, its development would be on a fairly large scale, possibly 30 to 50 mill. cu.ft. of gas per day. The transmission of these large volumes of gas would mean that gas distribution would enter upon a new phase involving the use of steel mains under transmission pressures up to 300 lb. per sq. in.

The time would not appear to be far distant when the proposed East of Scotland grid will be connected to the West of Scotland grid, and the completion of an integrated grid system stretching from Ayr on the West Coast to Montrose on the East Coast can be regarded as capable of achievement by 1967.

Ten years hence we shall certainly not be thinking in terms

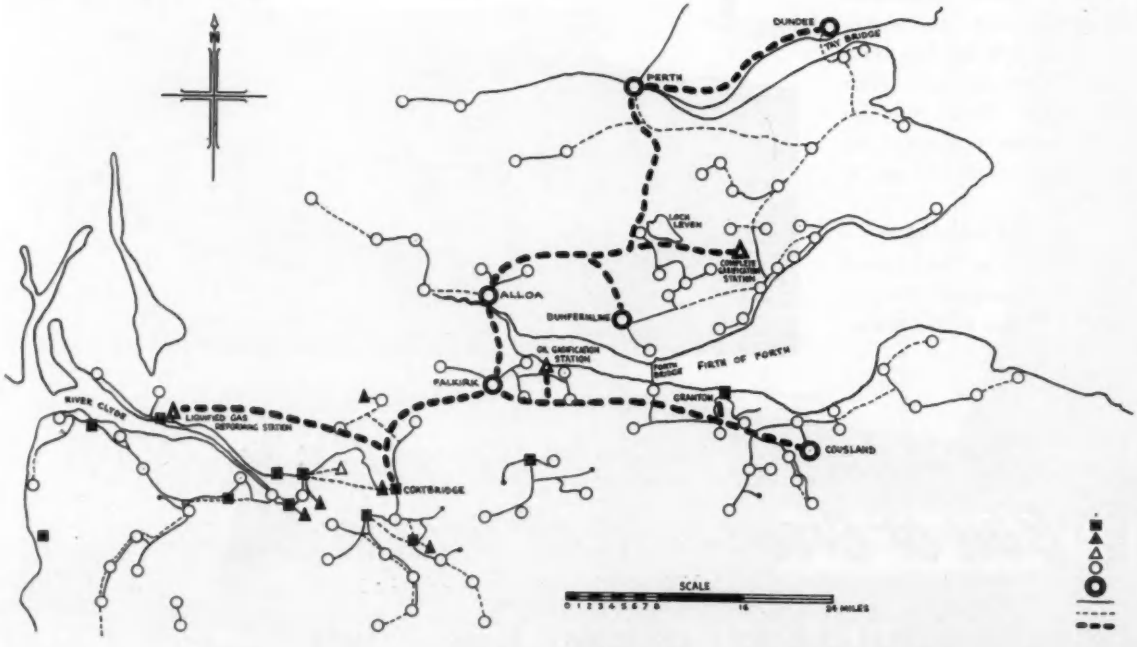

Fig. 1

of a large number of small gasworks each working within its own small orbit and each maintaining its own peak-load plant. The future provides every opportunity for the construction of a large-scale high-pressure gas grid, superimposed, if necessary, upon the grid systems outlined in the foregoing pages of this paper.

The plan (Fig. I) gives in outline the type of grid which may be developed in the future. The main features of this grid would be the complete gasification plant in Fife, producing gas but no coke, the large gasworks in Glasgow producing gas and coke from coking coal and also receiving supplies of coke oven gas, and the orthodox gasworks at Edinburgh producing gas and reactive coke from low-rank coals. Additional sources of gas supply may be provided by the oil gasification plant located near Grangemouth oil refinery and by reforming plants located on the Clyde to treat imported liquid methane.

In the development of this type of grid there are advantages to be gained by connecting the Edinburgh and East Lothian grid to the system, possibly at a point located near Falkirk.

During the next few years it should be possible to decide whether or not the natural gas well at Cousland can be used for underground storage; and if, in fact, this should become a practicable proposition, the grid would be extended to Cousland. The practical and economic advantages of large-scale underground storage are indeed attractive, and it may well be that the possession of such large storage facilities would be even more valuable than the natural gas which is known to exist at Cousland.

The Scottish gas industry has begun to move from the condition of technical stability which it has enjoyed for so long, to the mobile and changing conditions of the future. The new era which is in sight can prove to be the most exciting and progressive in the history of the gas industry, provided that we are willing to apply the freshness of thought and outlook which are so necessary to the development of an industry which has acquired a 'new look.' The task before us demands faith in the policy of integration, and, above all, faith in the gas industry.

Analysis and Testing of Coal and Coke

FIRST published in 1942, B.S. 1,016, 'Methods for the Analysis and Testing of Coal and Coke,' brought together in one publication a series of test methods previously dealt with in single standards, and included information on the laboratory preparation of samples for analysis. The standard was also linked directly with a companion specification (B.S. 1,017) on methods of collecting samples.

Continued work by the committee concerned and international discussion under the ægis of the International Organisation for Standardisation have led to revision of both standards. B.S. 1,016 now deals only with the analysis and testing of coal and coke; the preparation of samples for analysis will be dealt with in the forthcoming revised B.S. 1,017.

The new standard, B.S. 1,016, is being published in separate parts, each covering a particular group of analysis—proximate analysis, ultimate analysis. This method of presentation will permit the revision of any part with the minimum delay, without the necessity of issuing a new comprehensive standard. Where the methods for a particular group of analyses for coke differ widely from those for coal they will be published as a separate part, but where the modifications for coke are slight they will be included as separate sections of the same part.

Part 2, 'Total Moisture of Coke,' deals with the determination of the moisture in the coke 'as sampled.' Only one method is specified, the indirect method, this being essentially the same as that given in B.S. 1,016:1942. Details of air-drying and reduction in particle size have been omitted from this standard, as these will be covered fully in the revised B.S. 1,017. It should be noted that, unlike coal, the dry coke, after the determination of total moisture has been carried out, may be used for the preparation of other samples.

New Method

Part 3, 'Proximate Analysis of Coal,' deals with the determination of moisture, volatile matter, and ash in the analysis sample. The determinations are empirical and any deviations from the methods specified may lead to erroneous results. A new method for the determination of moisture has been introduced, differing from those previously specified in that the water driven off is absorbed and the moisture calculated from the increase of weight of the absorption tube. A variation of the vacuum oven method is also included.

Only one method is specified for the determination of volatile matter, as extensive series of tests in different laboratories have established that it gives reproducible results for all ranks of coal. The alternative methods in the 1942 version of B.S. 1,016 have, therefore, been omitted.

In the method for the determination of ash the rate of heating and the degree of ventilation of the muffle furnace have been specified more closely than previously as it has been shown that these influence the degree of fixation of sulphur in the ash. A second method, which is convenient for laboratories handling large numbers of samples is included as an alternative.

Part 4, 'Proximate Analysis of Coke,' deals with the determination of moisture, volatile matter, and ash in the analysis sample. One method only is given for each determination, each being a more closely specified version of methods described in B.S. 1,016:1942. The tube method for volatile matter has been omitted, since it is now regarded as unnecessarily complicated. The determinations are empirical and any deviation from the methods given may lead to erroneous results.

Copies of these publications may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Part 2, 2s. 6d., Part 3, 5s., Part 4, 3s. 6d.

WORLD COAL PRODUCTION

European Community Figures

FOR the first time, during 1956, official annual statistics of the Soviet Union have been published in which the production of coal and of lignite were indicated separately. This has involved considerable modification in figures published previously, according to Statistical Information, January-April, 1957, issued by the European Community of Coal and Steel.

There is a great deal of uncertainty with regard to the figures for the Republic of China. This country has, up to the present, published no official statistics on the production of coal. There exist several publications which present considerable differences for 1955 these differences range from 10 to 20 mill. metric tons.

The demand for energy which continues to grow in nearly all countries of the world and which, in 1956, was again greater than during preceding years, has produced a new increase of about 87 mill. metric tons in world production of coal which has reached 1.68 milliard metric tons—a new high level. In Europe, where production is less elastic than in many countries of other continents, the increase has, however, only been 5.4 mill. metric tons, of which 4 mill. are represented by Western Europe. The increase in the Community countries is 2.8 mill. In the countries of the eastern block (without the Soviet Union) the progress has sensibly slowed down. It is principally due to lack of labour that these countries have not been able to increase production in accordance with their plans. The share of Europe (without the U.S.S.R.) in world production which, in 1954, had grown to 44% fell to 36.6% in 1956.

Coal production in the U.S.S.R. is growing annually by about 30 mill. metric tons. Its share in world production which, in 1950, was no more than 12.9%, rose in 1956 to 18.1%. Constant development is also seen in the Republic of China. According to reports, there is reason to foresee there also a continued growth of production in the course of the next few years.

In the United States of America, production of anthracite and bituminous coal rose in 1956, according to provisional data, to 483.5 mill. metric tons.

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LONDON JUNIORS' A.G.M.

A CALL for better attendance at meetings and visits was made at the Annual Business Meeting of the London and Southern Junior Gas Association, held on May 31. The plea was made by Mr. L. J. Clark (North Thames) when proposing the adoption of the Council's report for the session 1956-57. Young members were much influenced by the behaviour of older members, he said, and the latter's failure to play a full part in the Association's activities set a bad example. The advantages of membership were stressed by Mr. C. Ryder who seconded the proposition. He maintained that the Association provided an excellent forum for young people to express their opinions—and even make fools of themselves! A further call for more enthusiasm, this time in the preparation of short papers, came from the President, Mr. J. B. McKean (South Eastern), who during the course of the meeting received an award of ten guineas in recognition of his services to the Association.

Medal awards for the year were as follows: *Milbourne Prize, 1956-57.* Awarded to Mr. H. R. Cooke for his paper entitled 'Industrial Applications of Air Heating by Gas,' read at the meeting held on May 3, 1957. *The Society of British Gas Industries Silver Medal Award, 1956.* Awarded to Mr. C. Ryder for his paper, 'Pressure Gasification—One Way to a Cheaper Therm,' read at the meeting held on December 4, 1956. *President's Prize, 1956-57.* Awarded to Mr. A. P. Porchmouth for his paper entitled 'Elimination of Carry-over from Coke Quenching Towers,' read at the Short Paper Meeting held on May 3, 1957.

During the meeting the Financial Statement was adopted at the proposition of the Hon. Treasurer, Mr. D. G. Winslow, seconded by Mr. N. R. Junkison. At the proposition of the President, the usual donation of ten guineas was made to the I.G.E. Benevolent Fund. Mr. C. A. Deas and Mr. W. Johnson were elected Hon. Auditors at the proposition of Mr. E. A. K. Patrick, seconded by Mr. E. V. Lucas. A presentation of ten guineas was made to Messrs. J. V. Rigg and H. R. Cooke for their past endeavours as Transactions Secretary and Assistant Secretary, respectively.

Members elected to serve as officers for the new session are as follows: *President,* Mr. J. E. Gray; *Senior Vice-President,* Mr. C. H. Purkis; *Junior Vice-President,* Mr. R. K. Harrison; *Hon. Secretary,* Mr. J. D. Grant; *Hon. Assistant Secretary,* Mr. C. P. Henshilwood; *Hon. Transactions Secretary,* Mr. J. E. Mills; and *Hon. Assistant Treasurer,* Mr. T. J. Basford. Messrs. H. R. Cooke, J. R. Fairman, and J. V. Rigg were elected to fill three vacancies on the Council, the other members being Messrs. D. E. Crowther, E. A. K. Patrick, A. P. Porchmouth, P. J. Savage, C. H. Townsend. Their election was proposed by Mr. J. R. Kenward, seconded by Mr. J. A. Nichols. Ex-officio members of Council will be Mr. N. R. Junkison, Past President 1955-56, and Mr. J. B. McKean, Past President, 1956-57. At the proposition of Mr. C. H. Townsend, seconded by Mr. N. T. Wait, Messrs. J. F. Gray, C. H. Purkis and A. H. Savill were elected to serve on the District Education Committee.

Proposing a vote of thanks to the Technical Press, Mr. R. K. Harrison spoke of the value to members who found it difficult to attend meetings of being able to read reports in the Press and sympathised with the difficulties the journals experienced as a result of increased costs of paper and printing. Mr. G. W. Battison, Editor of the 'GAS JOURNAL,' responded.

General Management Course

THE fifth residential course of the British Institute of Management, Luton branch, for managers and assistant managers is being held at Pendley Manor, Tring, commencing October 18, 1957, and extending over six long week-ends at approximately monthly intervals. The course deals with the problems and techniques of general management and is designed to show the specialist manager, why, where, and how his activities as a specialist must be co-ordinated into the general management structure.

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APPOINTMENTS VACANT

SOUTHERN GAS BOARD

CHEMIST

APPLICATIONS are invited for the post of CHEMIST at the Board's Central Laboratories at Poole, Dorset.

Applicants should have a University Degree or its equivalent in Chemistry, and previous experience of the Gas Industry would be an advantage. The appointment will be within Grades A.P.T. 6-8 (£640-£825 per annum) and the starting salary will be dependent on the qualifications and experience of the successful applicant.

The successful candidate will be required to pass a medical examination and, unless already subject to a pension scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Southern Gas Board Staff Pension Scheme.

Applications, to be made on special forms to be obtained from the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, should be returned upon completion by July 1, 1957.

P. VALON BENNETT,
Personnel Manager.

ENGINEER familiar with the gas and/or coke-oven industry and works practice, who can write clear and concise English, required as assistant to the editor of a monthly technical journal. No. 323, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

NORTH EASTERN GAS BOARD

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TECHNICAL ASSISTANT

APPLICATIONS are invited for the above position at a salary within Grade A.P.T. 5 (£605-£685 per annum) of the Salary Scales agreed by the National Joint Council for Gas Staffs. The commencing salary will depend upon qualifications and experience.

Applicants should have completed their National Service and possess a sound theoretical knowledge of Chemistry, and be capable of carrying out the usual routine tests for the control of Gas Manufacture.

The successful applicant will be required to pass a medical examination and to join the Board's Staff Pension Scheme.

Applications, giving education, qualifications and experience, should reach C. A. Newham, Esq., Group General Manager, North Eastern Gas Board, Bradford Group, Britannia House, Bradford, by June 22, 1957.

J. C. GARDNER,
Secretary.

WALES GAS BOARD

APPOINTMENT OF DISTRIBUTION ENGINEER —SWANSEA UNDERTAKING

APPLICATIONS are invited from suitably qualified persons for the above appointment for which the salary will be within Grade 12 A.P.T. Provincial 'A' (£945-£1,070) commencing at a figure commensurate wtih qualifications and experience. The post is pensionable.

Experience in Modern High/Low Pressure Gas Distribution Practice is necessary, including mainlaying, planning, and complete control of the mains, services, fittings and meter repair departments of the Undertaking. The person appointed will also be required to carry out Group Advisory Distribution duties.

The position is one of responsibility with a rapidly developing Undertaking in a coastal town; there are continuously expanding industrial and domestic gas loads; the town has a completely re-built modern shopping centre, extensive residential areas and holiday bays located within a few miles of the town centre.

Preference will be given to applicants with qualifications in Gas Engineering (Supply) or similar appropriate qualification, and with suitable experience in Gas Distribution Practice.

The successful applicant will be required to pass a medical examination.

Housing accommodation at a reasonable rental will be available if required.

Applications stating age, experience, professional qualifications, education and particulars of training, together with the names of two referees, should be received by the undersigned not later than Wednesday, June 26, 1957.

A. PICKARD, M.Inst.Gas.E., M.I.I.A.,
General Manager and Engineer.

Gas Offices,
Kingsway,
Swansea.

NORTH WESTERN GAS BOARD

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ASSISTANT DISTRICT DISTRIBUTION ENGINEER—ST. HELENS DISTRICT

APPLICATIONS are invited for the above pensionable appointment at a salary within grade A.P.T. 9 (£795/£895 p.a.).

Applicants should have a sound knowledge of modern distribution practice and should be Associate Members of the Institution of Gas Engineers or possess an equivalent qualification.

Detailed applications, giving the names of two referees, should reach the General Manager, South Lancashire Group, N.W.G.B., Radiant House, Cotham Street, St. Helens, within 14 days.

SCOTTISH GAS BOARD

ASSISTANT TO INDUSTRIAL RELATIONS OFFICER

APPLICATIONS are invited for the position of an Assistant to the Board's Industrial Relations Officer.

Applicants should be well experienced in administration preferably associated with industrial relations, personnel management or staff control. A knowledge of wages structures and conditions of service in industry, and of wage negotiating machinery in general is desirable.

The salary will be on a scale of £860 to £1,070 per annum (A.P.T. 10-12) with initial placing according to qualifications and experience.

The post is pensionable, and the successful applicant will be required to pass a medical examination.

Applications stating age, and giving particulars of education, training, experience and qualifications, together with the names of two referees, should be addressed to the undersigned within 14 days of the appearance of this advertisement.

A. T. HERD,
Secretary.

26, Drumsheugh Gardens,
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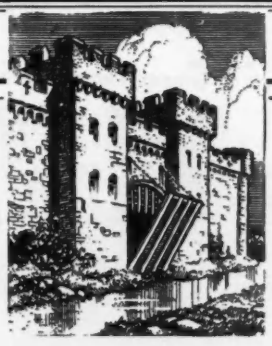

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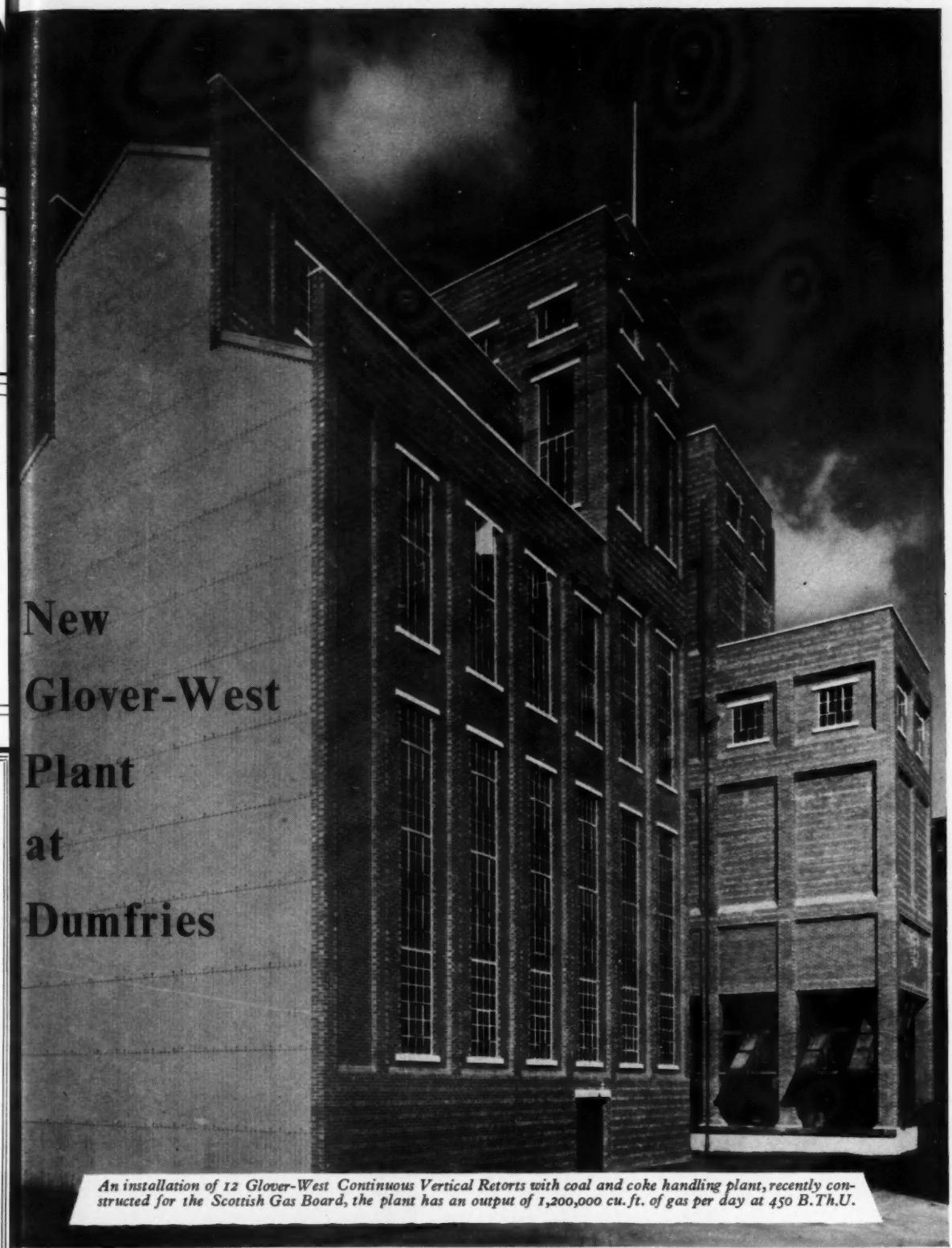

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